

# **Drivers' perceptions of cyclists**

**Prepared for Charging and Local Transport Division,  
Department for Transport**

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## Executive Summary

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Increasing the amount of cycling and improving the safety of cyclists are key aims of the Government's transport strategy, as set out in the White Paper 'A New Deal for Transport – Better for Everyone' (DETR, 1998). Previous research has shown that one of the main deterrents to cycling is a fear of traffic, often attributed to the attitudes and behaviour of drivers.

This report summarises the methodology and results of a research project that investigated drivers' perceptions of cyclists. The key aims of the research were to:

- compare the views of the identified driver types;
- compare the views of drivers within different geographical areas;
- investigate driver tolerance of cyclists and behaviour towards different types of cyclists;
- investigate driver behaviour in different driving situations;
- explore levels of knowledge of cycling facilities;
- investigate drivers' suggestions for improving the driver/cyclist interaction; and
- examine levels of driver and cyclist adherence to the Highway Code.

The research was phased and broadly categorised to ensure coverage of all the essential aspects of the topic and to allow for development of understandings and concepts as the project progressed. Each research phase was completed prior to commencement of the subsequent phase to allow for interim findings to guide the direction of the following work. The research methodology was as follows:

- *Qualitative Research* – This phase began with a review of relevant literature and analysis of STATS 19 accident data. The findings from the initial work were then used to direct the composition and content of eight group discussions and twenty individual depth interviews that were held with a representative sample of the public.
- *Quantitative Research* – With input from the 'Qualitative Research' phase, interview questionnaires were designed and completed with a controlled sample of 620 drivers. These interviews were held to gather more precise data on drivers' attitudes, intentions and behaviours towards cyclists.
- *Testing of the Research* – This phase allowed for clearer linking of attitudes and perceptions with actual driver behaviour through simulated trials and effectiveness of interventions to change driver responses.

At each phase of the research, findings were explored with respect to a number of psychological theories, particularly the 'Theory of Planned Behavior'. This theory posits that human intentions are formed as a result of the interaction of three elements:

- attitude;
- social norm; and
- perceived behavioural control.

The data gathered from each of the research phases are highly supportive of the conceptual framework and suggest that the 'Theory of Planned Behavior' could provide an appropriate structure for steering future research in this area.

Throughout the research it was observed that drivers do not have particularly strong feelings towards cyclists compared to their level of feelings towards other groups of road users. However, when prompted, it is clear that motorists hold negative views of cyclists and tend to classify them as an 'out group' with significantly different characteristics from most other road users.

Analysis of the research suggests that the unpredictability and the inherently or deliberately 'different' behaviour of cyclists are seen to be particular sources of irritation to drivers when those issues then compromise the drivers' own convenience.

When encountering a cyclist in circumstances that require care, most drivers appear to recognise that they should give consideration to the cyclist. However, their actual behaviour may be affected by their perception of the 'social norm' and the related pressure that they feel from other drivers as part of their 'in group'.

This research has also revealed evidence that the response of drivers when encountering cyclists is influenced by the context of the encounter. The apparent lack of understanding of how to use certain types of infrastructure leads to a diversity of improvised driver responses at these locations that may be unsettling or alarming to cyclists. Where infrastructure is understood and clearly defines ownership of the road space, this appears to increase driver confidence when encountering cyclists. Where a cyclist is encountered within a context that causes a driver to slow down or deviate, drivers' estimation of the cyclist's discourtesy was seen to increase regardless of the cyclist's actual behaviour.

On the basis of this research, a number of recommendations may be made relating to highway design, awareness raising, enforcement and areas for future research:

- physical road features that force cyclists and drivers into close proximity should be avoided, or where this is unavoidable, motor vehicle speeds at such locations should be reduced;
- highway designs that deliberately require cyclists to obstruct traffic in order to produce a traffic calming effect should be avoided as they are likely to cause particular frustration to drivers;
- education of drivers should focus not on helping them to predict cyclist behaviour but on understanding the circumstances, including driver behaviour, that will influence cyclist behaviour;
- training to improve awareness of required behaviours at road features and cyclist facilities may be helpful for both drivers and cyclists;

- the current low level of enforcement of traffic law with regard to both drivers and cyclists should be increased;
- further research should be conducted in order to establish whether the frustration experienced by drivers is translated into negative behaviour; and
- further research into the regional variations in attitude to cyclists may be useful in identifying practices likely to promote a better relationship between cycle users and motorists.

# 1 Introduction

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## 1.1 General background

Previous work on attitudes to cycling and cycling facilities was commissioned by the Department and carried out by TRL Limited. These projects focussed on attitudes from the point of view of cyclists and potential cyclists. The general aim of this study was to probe other people's perception of, and attitudes towards, cyclists when driving, i.e. drivers' perception of cyclists.

The earlier attitudes work revealed that one of the main reasons for people dismissing cycling as a genuine form of transport was fear of actual and perceived road danger. Cyclists said it was the attitudes and behaviour of many drivers that contributed to this fear. Conflicts between drivers and cyclists could also be a result of difficulties in spotting a cyclist against a background of a complex traffic environment. It was proposed that changing drivers' attitudes and, at the same time, making cyclists more conspicuous by changes in road conditions, could contribute to more people taking up cycling.

The earlier work also showed that cyclists are not perceived to be high on most drivers' road user status hierarchy. This perception also has implications for driver behaviour and safety of cyclists, as other research has shown that road users who are deemed to be of low status are treated with less care and consideration.

TRL led the research project with extensive input from The University of Strathclyde and also Ipsos-RSL.

## 1.2 Overall methodology

The main stages of the study methodology are as follows:

- review of literature;
- cluster analysis of STATS 19 accident data to identify driver types more likely to be involved in cyclist casualties;
- focus groups with drivers;
- qualitative individual depth interviews with drivers;
- quantitative interviews with drivers;
- analysis of self-reported driver behaviour;
- development of ideas for improving cyclists' safety, based on the above;
- prioritisation and feasibility testing of ideas;
- testing drivers and scenarios using the TRL Virtual Reality equipment;
- testing driver responses to different interventions using video clips; and
- to produce recommendations for measures, initiatives and programmes that will change drivers' perception of cyclists and create a better and safer environment for cycling, which will in turn encourage more cycling.

## 1.3 Theoretical framework

The following theoretical framework has been established to guide the research. It is based on a model that has been developed in the United States over the last fifteen years

called the 'Theory of Planned Behavior'. The 'Theory of Planned Behavior' states that 'behaviour is the endpoint of cognitive decisions'. Intentions (which precede behaviour) are influenced by the following three factors:

- attitude;
- social norm; and
- perceived behavioural control.

These elements may be briefly explained as follows:

- *Attitude* encompasses a range of factors but may be summarised as general orientation towards, in this case, cyclists and the degree to which they are viewed as legitimate road users. Attitude also encompasses the subjective assessment of the characteristics of cyclists as sharers of road space.
- *Social Norm* arises when a decision is required and reflects what the individual believes to be the prevailing social consensus on the appropriate response to a given set of circumstances.
- *Perceived Behavioural Control* is the degree to which the individual believes that they have the ability to act as they would wish. For example, an individual may wish to travel by train rather than drive and may appreciate that this would have a moral benefit that would accord with the 'social norm'. But they may believe that they are unable to exercise this option (i.e. to behave in a certain way) because the train service is too unreliable. They may therefore choose to drive but that behaviour is not necessarily indicative of a negative attitude towards train travel. Rather their level of perceived behavioural control is too low for them to follow the prompting of their own attitude and those of society.

Perceived behavioural control has important implications for research programmes as, to bring about a change in behaviour, it is important to influence inappropriate perceived behavioural control.

The background to and relevance of the 'Theory of Planned Behaviour' is discussed in more detail in Appendix A. This appendix contains details of and findings from the review of conceptual and applied psychological literature that was conducted by the University of Strathclyde as part of the study's Literature Review.

# 2 Qualitative Research (Phase One)

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## 2.1 Review of literature

A literature review was an important first step in the project. It established and clarified the key points of the existing knowledge and research methods relevant to drivers' perceptions of cyclists. The output from the literature review also assisted in the design and focus of subsequent stages of the project.

The literature review provided information on the following:

- driver behaviour of concern to cyclists;
- locations, road design and conditions of concern to cyclists;

- types of driver involved in accidents with cyclists;
- previous studies of driver attitudes and behaviour, of relevance to this project; and
- the psychological conceptual framework for analysing driver attitudes and behaviour pertinent to this project (summarised in Appendix A).

The review drew on previous cycling and behavioural research and a new study of national accident data compiled by TRL and was undertaken jointly by TRL and the University of Strathclyde.

### **2.1.1 Driver behaviours of concern to cyclists**

Many of the TRL cycling research reports have drawn attention to the issue of cyclists' concern about driver behaviour. 'Attitudes to Cycling' (Davies *et al.*, 1997) discovered that one of the most important factors contributing to non-cycle use (other than car dependence) was the fear of danger from motor vehicles (specifically driver behaviour and traffic speeds). Some of the drivers who took part in the discussion groups readily admitted to getting annoyed with cyclists and to driving in an aggressive way as a result. In the 'New Cycle Owners' report (Davies *et al.*, 1998), many of those new cyclists who had ventured onto main roads described the experience in a very negative way ('absolutely petrifying', 'traffic thunders past'). A quarter of those involved in the project said that their experience of cycling on busy roads had caused them to reduce the amount of cycling that they did.

Several TRL reports have looked at specific traffic situations that are known to cause problems for cyclists. These have often revealed some of the specific problems that underlie the general concerns about traffic danger and rider behaviour. For example, a study into 'Further Developments in the Design of Contra-Flow Cycling Schemes' (Ryley *et al.*, 1998) found that cyclists could feel intimidated by oncoming motor vehicles which came too close, vehicles that drove at excessive speed, and vehicles emerging from side roads or accesses. TRL's summary report 'Achieving the Aims of the National Cycling Strategy' (Davies *et al.*, 1998) concluded that ways were needed to ensure far higher levels of driver care toward vulnerable road users, rather than just seeking engineering solutions.

### **2.1.2 Locations, road design and conditions of concern to cyclists**

The Literature Review identified some specific issues relating to drivers' perception of cyclists, driver behaviour at road narrowings, road design and road user training and education. These issues had implications for the project as follows:

#### *Problem locations*

There are a number of physical settings and facilities where cyclists experience problems as a result of driver behaviour. These include:

- narrow lanes, including those created by parked cars (where drivers may be tempted/pressurised to overtake cyclists without sufficient space);

- on the approach to pedestrian refuges/traffic islands (where drivers may be tempted/pressurised to overtake cyclists without sufficient space);
- at T-junctions (where drivers from the minor road may pull out in front of cyclists approaching from the right on the main road);
- at roundabouts (where drivers sometimes fail to see cyclists who are circulating on the roundabout);
- at junctions (where drivers sometimes overtake the cyclists and then turn left across them);
- cycle lanes (which some drivers treat as parking bays); and
- contra-flow cycle lanes (where oncoming drivers are driving too fast).

#### *Problem driver behaviours*

The identified set of problem locations generated a complementary list of driver behaviours that cause problems to cyclists:

- drivers attempting to overtake cyclists without sufficient space;
- drivers overtaking cyclists and then turning left across them;
- drivers from the minor road pulling out in front of cyclists on the major road;
- drivers failing to see cyclists who are circulating on the roundabout;
- oncoming traffic failing to give way to cyclists (when the cyclist has right of way);
- excessive speed and rapid acceleration/braking by drivers;
- obstructive parking and opening of car doors;
- apparent inattention by drivers (causing cyclists to question 'has he seen me?'); and
- aggressive behaviour involving some of the above.

### **2.2 Analysis of STATS 19 accident data**

While it is appreciated that this is not an accident study, it was felt it would be very valuable to analyse the accidents involving pedal cyclists over the three years 1996 - 1998, using the national STATS 19 accident database for Great Britain, with respect to two main dimensions:

- what types of driver, vehicle, location and light and weather conditions are most frequently involved in accidents with cyclists?
- are there differences in the distribution of these factors between accidents involving cyclists and those that do not?

The analysis of the accident database was not intended to provide a detailed study of cyclist accidents but to provide information to help decide which driver types to include in the group discussions and the individual depth interviews. It was also useful in selecting the traffic scenarios on which drivers were to be questioned.

The key findings of the analysis of the 1996 - 1998 accident data are as follows:



- 10% of all reported injury accidents involve a cyclist;
- 8% of all reported injuries are to cyclists;
- most drivers involved in accidents with cyclists are aged 25 to 49, particularly 25 to 39;
- younger drivers (17 to 24) are less likely to be involved in accidents with cyclists whereas older drivers (40 and over) are more likely to be involved, relative to accidents not involving cyclists;
- most drivers (almost 70%) involved in accidents with cyclists are male. This is similar to the general ratio of male to female drivers involved in all accidents;
- three-quarters of accidents involving cyclists occur on single carriageway two-lane roads;
- almost three-quarters of accidents involving cyclists occur at or close to a junction: T-junctions (40%), crossroads (10%), roundabouts (9%), and private drives (6%); and
- most accidents involving cyclists occur in daylight (79%) and in good weather conditions (84%).

The STATS 19 analysis showed some differences between the distribution of types of driver, vehicle, location, light and weather conditions found in accidents involving cyclists and those not involving cyclists. However, these differences are at least partly explained by differences in the distribution of cycling and driving activity over the road network, over the day and as affected by weather and lighting conditions. One may conclude therefore that accidents involving cyclists share many of the attributes of other accidents.

### 2.2.1 Driver types and cycle accident involvement

Given the evidence of car drivers' salience in cycle accident involvement, (as part of Phase Two of the research study,) accident statistics for the year 2000 were analysed for any more information about the types of driver involved. Transport Statistics Great Britain provides details of the proportion of the population holding a full car-driving licence divided by age group and sex. Factoring these percentages by estimates of the Great Britain population in 2000 (the year of the data used in this section of analysis) gives an estimate of the number of drivers licensed to drive cars. These numbers can be combined with casualty data to develop tabulation showing cyclists injured in two vehicle collisions against car driver sex and age groups. Analysis by each driver group compared to all licensed drivers shows significant gender and age dependent variations.

Table 1 shows that adult cyclists are much more likely to be injured by a male driver than a female driver even after allowing for the fact that more drivers are male. The odds ratios suggest that the odds of a male driver being involved in a collision with a child cyclist are about 1.2 times higher than the odds of a female driver being involved. For an adult cyclist casualty this ratio is even higher at about 1.6.

The effect of driver age is also significant in the year 2000 data: the data are shown in Table 2. Drivers aged 30 - 49 are more likely to be involved in collisions with cyclists

**Table 1 Drivers involved in car collisions with a cyclist (two-vehicle) by sex, for the year 2000**

<i>Sex of driver</i>	<i>Cyclist casualty</i>			<i>Total</i>
	<i>Child</i>	<i>Adult</i>	<i>None</i>	
Male	2,875 61.5%	5,687 67.6%	18,315,514 56.5%	18,324,080 56.5%
Female	1,800 38.5%	2,729 32.4%	14,092,462 43.5%	14,096,991 43.5%
Total	4,679 100%	8,416 100%	32,407,976 100%	32,421,071 100%

**Table 2 Drivers involved in car collisions with a cyclist (two-vehicle) by age, for the year 2000**

<i>Driver age group</i>	<i>Cyclist casualty</i>			<i>Total</i>
	<i>Child</i>	<i>Adult</i>	<i>None</i>	
17-20	285 6.1%	516 6.1%	1,175,256 3.6%	1,176,067 3.6%
21-29	933 19.9%	1,695 20.1%	5,068,875 15.6%	5,071,503 15.6%
30-39	1,340 28.6%	2,243 26.7%	7,838,207 24.2%	7,841,790 24.2%
40-49	862 18.4%	1,740 20.7%	6,531,922 20.2%	6,534,524 20.2%
50-59	701 15.0%	1,216 14.4%	5,586,782 17.2%	5,588,699 17.2%
60-69	326 7.0%	575 6.8%	3,650,009 11.3%	3,650,910 11.3%
70+	232 5.0%	431 5.1%	2,556,926 7.9%	2,557,588 7.9%
Total	4,679 100%	8,416 100%	32,407,976 100%	32,421,071 100%

than drivers of other ages. A driver in the two oldest groups, 60 and above is much less likely to collide with cyclists.

Some caution is needed when using these data. Risk is being assessed implicitly against licensed driver numbers but not mileage. Driver traffic includes learner drivers and other unlicensed drivers so that these two tables underestimate total driver numbers. In addition, driver mileage varies with both sex and age. Part of the apparent excess casualties generated by male drivers and the reduced number of casualties involving older drivers may reflect differences in driver mileage.

### 2.2.2 Self-reported driver behaviour

An extension to the questionnaire survey carried out in Phase Two of this work was conducted in order to ascertain whether drivers with different characteristics were more likely to behave in negligent or deliberately

unsafe ways. Although this work was carried out some months after the Phase One Focus Group work and was based on the questionnaire sample described in the summary of Phase Two work, below, it is appropriate to report on the findings in this report section.

The areas surveyed in Phase Two were Hull, York, Leamington Spa, Bristol and Camden. The drivers were divided into two groups - domestic drivers and professional drivers – with quotas for each. These groups were then stratified: domestic drivers by age and sex; professional drivers by vehicle types (HGV, van and company car).

At the end of each survey the respondents were handed a single sheet driver behaviour questionnaire (DBQ) and post-paid envelope addressed to TRL. They were asked to complete the questionnaire and post it to TRL. From a total of 620 interviewees, TRL received 313 driver behaviour questionnaires, a response rate of 50 per cent. There were no significant differences between the sample returning a DBQ and the rest of the interview sample in terms of age or sex: 38 per cent of each sub-sample was female, and the ages were distributed across a span from 17 to 75. There were differences in the response to a question about the respondent's income: 9 per cent of the DBQ sample had refused to provide information about their income or said that they did not know what it was compared with 28 per cent of the total 620 interviewees. Respondents, who did not provide income data, were less likely to return a driver behaviour questionnaire than those who did provide income data (odds ratio about 1:5).

The questionnaire left with respondents was the most recent version of the *Manchester Driver Behaviour Questionnaire* (MDBQ) (Lawton *et al.*, 1997). There are twenty questions: each starts with the description of a driving fault and respondents are asked to indicate how frequently they perform each fault. In designing the scale the faults were characterised as Highway Code violations (HCV), aggressive violations (AV) and driver errors (E)

Analysis of the data gathered via this questionnaire revealed no significant associations between driver characteristics and self-reported tendency to commit errors, Highway Code violations or aggressive violations. Nevertheless, it must be borne in mind that this data related to self-reported behaviour and there is a significant likelihood that respondents may have been tempted to give 'correct' rather than strictly honest answers.

### **2.3 Focus groups and individual depth interviews with drivers**

The key stage of the study's 'Qualitative Research' took the form of eight group discussions, or 'Focus Groups', followed by twenty individual depth interviews held with individuals. In total, 78 drivers were involved.

#### *Focus groups*

Focus groups are recognised as an established technique for producing quality qualitative information at an early stage of a project, where the topic is relatively unresearched. For this study, each Focus Group comprised of between eight and ten people and lasted between ninety

minutes and two hours. Visual stimuli were used to promote discussion and where feasible, videos of situations of concern to cyclists were used. A topic guide was devised based on the results of the Literature Review and the STATS 19 analysis.

#### *Individual depth interviews*

The purpose of the individual depth interviews was to investigate in greater detail the issues arising from the Focus Groups, and to see if there were any other aspects of driver perception and behaviour that needed to be included in subsequent stages of the study.

#### *The sample*

Qualitative research does not aim to represent the general population in the way that quantitative surveys do, but rather to concentrate on the types of people who would be most likely to provide a spectrum of opinions relevant to the subject of the research. The Literature Review and the STATS 19 analysis gave indications for the types of driver that are of concern to cyclists, and should therefore be questioned in this section of the study. These included:

- high mileage/low mileage drivers;
- domestic (car) drivers and professional (goods and passenger) drivers;
- large car/small car drivers;
- young/old drivers; and
- experienced/inexperienced drivers.

Other categories of drivers that were investigated included:

- drivers who cycle; and
- drivers who do not cycle.

The sample of driver types was also structured to provide a good regional and socio-economic representation. The five areas of the country used were:

- York;
- Hull;
- Leamington Spa with Coventry;
- Camden; and
- Bristol.

#### *Method of analysis*

All research sessions (Focus Groups and individual depth interviews [IDIs]) were audio recorded. Notes were taken at all of the Focus Groups and transcripts were made from the audio recordings of the IDIs. These notes and transcripts were then translated onto content analysis grids whereby the different groups and IDIs could be compared easily. The content analysis forms the basis of the conclusions from this section of the study.

When looking at the different attitudes towards cyclists it was important to bear in mind the different variables of the sample and any effect that these may have had on responses. These variables include:

- interview methodology used (i.e. the differences in response that may be caused by the group environment of the Focus Groups as opposed to the one-to-one rapport of the IDI);
- gender – any difference in the responses of men versus women;
- age;
- driver type – differences between professional and domestic drivers, and within these two groups;
- cyclists versus non-cyclists; and
- geographic location of the Focus Groups and IDIs.

Presentation of the research findings in this report generally relates to both the results of the Focus Groups and the IDIs. Differences in responses according to any of the aforementioned variables is highlighted where relevant.

### **2.3.1 Drivers' perceptions of road users**

#### *Problem areas for motorists*

Initially the discussions were focussed on problems for drivers in general, rather than prompting specific consideration of cyclists. When discussing problems facing the motorist, those that were most readily identified (in both the Focus Groups and the IDIs) were:

- The general and overall increase in traffic congestion, with numbers of vehicles growing faster so that existing roads can no longer accommodate them, was the main preoccupation for most. It was stated that the driver now has to allow more time for everyday journeys and travel, when other demands on time are also becoming greater and greater.
- With the increasing number of vehicles on the roads, what was called 'inconsiderate driving' became not only more in evidence but also more unacceptable. It was felt that arrogance (such as 'hogging' the middle or 'fast' lane), unpredictable behaviour (such as failing to signal intentions) or generally not behaving in a courteous and generous manner (allowing traffic in from the side, etc.) could only exacerbate the problems caused by the increasing numbers of vehicles on the roads. Also relevant here were comments made regarding the speed travelled at by elderly drivers and the more uncertain novice drivers. It was notable that some respondents' definition of 'unacceptably slow' seemed to include those drivers travelling at the speed limit.

It appears that drivers are demanding more uniform and predictable behaviour from other road users to cope with the growing traffic congestion. As the traffic environment becomes more volatile, drivers may increasingly appreciate other road users who demonstrate awareness of their immediate and upcoming situations, including other users' intentions. Also, reliance on compromise with and courtesy from other road users may be considered more critical to the duration and ease of a journey.

Those attending the Focus Groups expressed a general tendency to be critical of other road users, regardless of mode. Respondents would claim to be considerate of other drivers, but perceived many other drivers as being

inconsiderate of them. This displays the typical psychological trait that people like to think they act better than what they perceive as the 'social norm'.

#### *Road users' hierarchy*

Respondents were asked to consider whether they believed a hierarchy existed according to different types of road users. They could base it on any variables they saw most appropriate.

The responses given indicated that hierarchies were generally based on a logical order in relation to size of vehicle – i.e. the larger the vehicle, the more respect it received from other road users; the smaller the vehicle, the more likely it was to come off the worst in an altercation. (Respondents considered motorcycles as an exception to this rule as their speed and manoeuvrability were thought to compensate for their lack of size.)

It is significant that when discussing other road users, motorists seldom mentioned cyclists spontaneously, their immediate associations being with drivers of other motor vehicles such as 'the white van', taxis and HGVs. Often, respondents had to be prompted before they thought of cyclists.

When the moderator, in both the Focus Groups and the individual depth interviews, entered cyclists into the discussion, they were the subjects of rather negative imagery, which may suggest an underlying conflict between drivers and cyclists. Respondents placed cyclists, perhaps not surprisingly, at the bottom of the road user hierarchy. (It should be noted though that respondents completely excluded pedestrians from their hierarchies, as the subjects did not consider pedestrians as 'true' road users.) Respondents justified the low positioning of cyclists not only by their size and lack of speed but also because of their seeming oblivion to the motor vehicles around them.

Respondents expressed that the respect that drivers of larger vehicles demonstrate towards other vehicles diminishes in proportion to the other vehicle's size – i.e., the smaller the other vehicle, the less their respect. However, it should be clarified that this did not necessarily mean that they would behave discourteously towards these smaller road users. Size was also reported as having other implications: such as, the fact that cycles are smaller meaning that they are harder to see. Drivers accused cyclists of not being aware of this and respondents who were drivers of larger vehicles reported that this tended to infuriate them (particularly HGV and bus drivers). Those respondents who were cyclists (and the drivers of other smaller vehicles) said they were unaware that the size of the larger vehicles impacted on their ability to see other vehicles beside and behind them. It was stated that the mass of larger vehicles results in many blind spots, of which other motorists and road users seemed to be unaware.

When prompted, all the professional drivers, regardless of whether they were carrying goods or passengers, tended to be less accepting of cyclists' presence on the roads they were using. They felt their livelihood was being interfered with – particularly if they were held up by a cycle, which was obviously slower than other vehicles, within their lane. It was reported that being caught behind a cyclist added further to the pressure on their work schedules.

### 2.3.2 Driver behaviour towards other road users

Respondents were asked what they understood by ‘considerate’ driving, and which factors determined what was good or bad behaviour in relation to other road users. The main characteristics which were felt to distinguish a considerate driver from an inconsiderate one, were as follows:

- awareness of others;
- being aware of what is happening a long way ahead/ reading the road;
- awareness of speed and space ratios (braking distances and times needed by other types of vehicles);
- smooth, constant speed (erratic speed was seen as irritating – for example, hesitancy of learners);
- respect of the road rules;
- proper signalling of intentions; and
- proper use of the vehicle:
  - giving way when required, but also giving way when one has the right of way, i.e. letting people in from side roads, or allowing oncoming traffic to turn right in heavy traffic;
  - visible gratitude for other’s courtesy (a wave, flashing one’s lights) and acknowledgement of kindness; and
  - courteous behaviour encouraged courteous behaviour.

*(Note that all the above attributes were perceived by respondents to be absent from most cyclists’ behaviour on the roads.)*

While courtesy forms a key component of this list of characteristics of a ‘considerate’ driver, motorists then went on to justify drivers’ lack of courtesy to cyclists by seeing cyclists not as being ‘proper’ road users. Although according to the law cycles and motor vehicles are equals on the road, many drivers involved in the study, particularly those driving for a living, did not accept this fact. Reasons behind this lack of acceptance included the perception that cyclists were apparently not obliged to financially contribute to the road usage (no road tax, no insurance).

As well as feeling that cyclists were getting special treatment by not having to contribute financially, other aspects of cyclists’ behaviour were felt to exacerbate bad feeling towards them. These included cyclists’ apparent disregard for the rules of the Highway Code (such as passing through red lights) as well as general inconsiderate and potentially dangerous behaviour, such as failing to signal before manoeuvring.

It appears that confusion regarding the road user status of cyclists may contribute to drivers’ inconsistent treatment of cyclists, compared to other motorised road users. Cyclists are classed as equals on the road in one aspect of the law, yet appear to be exempt from some of the enforcement issues and other requirements (such as licensing) faced by other road users. Also, the actions of some cyclists, such as riding on the footway, are in obvious breach of the Highway Code rules that other road users must physically and legally abide by. This may further aggravate the cyclist/driver relationship.

### 2.3.3 Perceptions of cyclists

Respondents were asked to consider the case of cyclists in more detail and gave their spontaneous associations.

#### Reasons for cycling

In the individual depth interviews, drivers were asked why they thought people used cycles to get around. It was felt that they were doing it for:

- economy;
- enjoyment;
- to get fit; and
- convenience.

It was not felt that environmental issues motivated many cyclists, or that the ability to get through urban gridlock was a motivator, but that these were considered as fortunate by-products.

#### First impressions/associations of ‘cyclists’

As noted in other sections of this study, when drivers were asked to specifically focus on cyclists, associations with them were found to be predominantly negative rather than positive. It is important to note that although some level of negativity appears to exist, there does not appear to be any over-riding hostility shown by drivers towards cyclists.

Respondents provided the following reports of their immediate impressions of and associations with cyclists:

Positives	Negatives
<ul style="list-style-type: none"> <li>● <i>Healthy</i> – in terms of personal and environmental benefits; and</li> <li>● <i>Brave</i> – cycling in motorised traffic despite their lack of any real protection.</li> </ul>	<ul style="list-style-type: none"> <li>● <i>Vulnerable</i> – perceived greater potential for involvement and then injury or death from traffic accidents;</li> <li>● <i>Irresponsible</i> – due to an absence of training or formal commitment to lawful behaviour;</li> <li>● <i>Despised</i> – cycling should be provided for through separate facilities and not allowed on roads;</li> <li>● <i>Dangerous</i> – cyclists pose risks to themselves and other road users;</li> <li>● <i>Erratic/Unpredictable</i> – for example: weaving in and out of traffic, not signalling intentions, etc.;</li> <li>● <i>Arrogant</i> – it was felt that cyclists seemed to believe they were invincible or that other road users were responsible for their safety; and</li> <li>● <i>Inconvenient</i> – basic characteristics of cycling were perceived as fundamentally different and delaying to motorised road use.</li> </ul>

The respondents’ first impressions of cyclists are on the whole negative and are consistent with the images that came out of the hierarchy projective exercise explained above (Section 2.3.1). Many of these impressions could

suggest resentment towards cyclists, such as the feeling that cyclists, unlike other road users, lacked responsibility (having no road tax, insurance, or licence). Interestingly, there was no mention even among those who cycled that cyclists pay taxes indirectly, such as through council tax and other general taxation; or that many cyclists are also car owners and therefore do pay road tax; or that some cyclists do choose to carry third party liability insurance.

#### **2.3.4 Reactions to sketches of different cyclist types findings**

In the group discussions, sketches of different types of cyclist were handed out, participants asked to describe them and to say what sort of behaviour they would expect from each type of cyclist.

The pictures shown to the Focus Groups showed:

- a family cycling, where each member of the family wore a helmet;
- a girl on a cycle with a helmet on;



- a young man on a cycle, without a helmet on;
- an older woman on a cycle with a pet riding in the cycle's front basket, the woman was not wearing a helmet;



- a pack of professional-looking cyclists, all with helmets on; and
- a young boy riding a BMX cycle on one wheel whilst wearing no helmet.

It was found that how the cyclist looked had a definite effect on the way motorists believed the cyclist would behave.

Pictures of cyclists wearing helmets were generally considered to be more serious and sensible on the road than those without. Respondents identified one exception to this feeling; packs of racing cyclists, though wearing helmets, were not considered to be as sensible as lone cyclists in helmets, but this was because the erratic behaviour of the group outweighed the positive associations of a cycling helmet.

In general it was felt that people who had arranged appropriate and/or specialist cycling equipment and clothing were more likely to have also the experience and/or training to employ correct cycling behaviour. However, there was also a contrasting (minority) feeling that cyclists wearing helmets might be more timid and cautious than those without, wearing a helmet out of fear rather than as a sensible precaution.

#### *Ideal cyclists*

When respondents were asked to define characteristics of an 'ideal cyclist', it was found that the ideal cyclist had to be a responsible one. Respondents suggested that this would be demonstrated through awareness and courtesy towards other road users, as well as abiding by the Highway Code, as motorised vehicle drivers are required to do. A cycling proficiency test certificate or licence was seen as a good indication of responsibility acceptance and the concept was welcomed by cyclists and drivers alike. However, the enforcement of such a system was acknowledged as difficult or even impossible. A sizeable minority of respondents suggested that a minimum cycling age could be introduced to reduce the numbers of inexperienced children on cycles on the road. (No estimates of an appropriate minimum cycling age were specified.)

Drivers, particularly those that did not cycle themselves, felt that 'having the proper kit' was an indication that the cyclist was likely to behave responsibly. The 'proper kit' was deemed to include:

- wearing a helmet, for protection and prevention of injury;
- having working lights and reflectors, for visibility; and possibly
- the addition of mirrors (as on a motorcycle), to enable the cyclist to see behind them.

The obligatory wearing of cycle helmets (as with seatbelts) was felt by many respondents to be a step that should already have been taken. In fact, a minority of respondents had assumed that it was already mandatory with enforcement of the law being extremely lax.

It was felt that an ideal cyclist, to justify their 'right' to the road, would provide some financial contribution or road tax, however minimal. Again there was some call for the requirement of insurance for cyclists, to protect drivers from solely having to pay for the costs of a collision that may not be their fault. At the time of conducting this 'Qualitative Research', the only method of recovering costs from the cyclist was to pursue a potentially expensive and time-consuming civil law suit.

### *Visibility issues*

One of the problems with cyclists in traffic had been identified as their seeming invisibility in certain situations and conditions. Discussion was held on the factors that were believed to conceal cyclists and the following were identified:

- external factors such as poor weather conditions or lack of lights;
- inherent factors such as the small size of a bicycle relative to most other vehicles;
- poor cycling behaviour such as lack of signalling and coming up on the inside of vehicles;
- physical barriers to perception such as blind spots caused by vehicle dimensions and lack of noise of cycles; and
- driver unfamiliarity with cyclists and therefore their not expecting to see cyclists.

Previous research had suggested that a reason behind poor visibility of cyclists during the daytime could be due to drivers not expecting to see them and therefore not looking out for them. This suggestion was put to respondents. Many agreed that this could be true, as drivers already had a number of things to be aware of when driving. However, according to a number of individual interviews this was felt to be no more than a 'poor excuse' for blatant disregard. These respondents felt that some drivers who did not perceive cyclists as being an 'equal road-user' did not treat cyclists with due care and attention, purposefully disregarded them, and if challenged about their behaviour they would simply claim that they had not seen the cyclist.

### **2.3.5 Cyclist/driver interaction**

Respondents now addressed the subject of types of driver behaviour which they believed were of most concern to cyclists and what types of situation contributed to driving which was less considerate to cyclists.

Drivers were asked what they thought were the most problematical occasions for cyclists on the roads. The situations that they felt were most hazardous for cyclists are:

- left turns in general:
  - either the left turning motorist cutting in on a left turning cyclist; or more dangerously;
  - cutting in front of the cyclist who was going straight ahead, with the motorist believing he could make a left turn prior to the cyclist reaching the junction.
- right turns:
  - the cyclist having to cut across the flow of traffic to make his turn.
- roundabouts:
  - motorists were more used to concentrating on motor vehicles, therefore not being aware of or overlooking cyclists; and
  - cyclists were expected (and it was believed that they were obliged by the rules of the road) to act like

motorists on roundabouts, but it was very difficult for them to do so in competition with motor vehicles.

- poor visibility:
  - rain, fog, dusk – times when cyclists' visibility was reduced even more than usual particularly since many motorists appear to not actively look for cyclists.
- uneven road surface:
  - pot holes, drains, grates – all areas where cyclists could suddenly veer into the road in front of motorists.
- parked cars/car doors opening:
  - situations where cyclists could be forced to swerve into the motorists' path.
- bollards and pedestrian refuges:
  - narrowings where motor vehicles have to slow down.
  - cycle lanes suddenly coming to an end with no clear route for the cyclist to follow; forcing them back into the mainstream of traffic.
- ignoring the rules of the road:
  - cyclists going the wrong way along a one way street;
  - cyclists jumping red lights; or
  - cyclists riding on pedestrian footways.
- knots of cyclists emerging suddenly into the traffic flow:
  - outside schools and factories.

It is interesting to note that drivers identified that cyclists put themselves at particular risk when ignoring the rules of the road. In response to this statement, it may be important that the education and publicity exists to ensure that cyclists are aware of the correct and legal behaviour. Such training should be extended to include all road users, including drivers.

Respondents were also asked for their opinions on general road design and the road environment. One problem area that was identified was the lack of knowledge about the correct use of cycle facilities on the roads, not only on the motorists' part but also on the cyclists'. This lack of knowledge was felt to be a result of insufficient publicity regarding the correct usage of such facilities and a lack of enforcement of any rules that may apply.

Thus, for example, neither cyclists nor motorists knew if it was anything more than extremely inconvenient if motor vehicles drove or parked in the cycle lane, or pulled up to the advanced stop line (ASL) if there were no cyclists in the ASL area.

Inconsistencies in the design of cycle facilities were also an important factor in confusion over their usage. For instance, cycle lanes were found to differ in four ways:

- coloured green;
- coloured red;
- no colouring at all; or
- no colour and no boundary line (solid or otherwise), only an intermittent cycle symbol.

Also, the actual facilities provided were not always seen to be adequate. For example, (from a cyclist's point of view) they tended to lack continuity, stopping and starting without warning. They were also felt to be incompatible with bus routes, in that buses legitimately had to block cycle lanes in order to pull up at bus stops. On a more positive note, however, no matter how inadequate the facility, its existence was felt to raise the awareness of cyclists on the road to at least some degree.

Conversely, there was some underlying feeling that non-use of cycle lanes where they did exist may cause resentment, fuelling such attitudes as 'cyclists get all this special treatment and then don't use them'. On the other hand, ASLs were felt to legitimise cyclists' action of sitting in front of traffic (to get a head start) but this could cause two possible reactions:

- cyclists were no longer breaking the law by crossing the white line (something which could annoy drivers); or
- cyclists were now encouraged/permitted to slow down traffic and cause delay and thus frustration and resentment.

It appears that cycle facilities had their own set of issues to be considered. A lack of awareness and knowledge of usage among drivers coupled with a lack of enforcement of correct usage certainly seemed to be a common problem. These facilities also seemed to be a potential cause of resentment towards cyclists, due to issues over their perceived funding by drivers and not cyclists, but also because of their existence and the way they legitimised some of the more annoying behavioural aspects of cyclists, such as holding up traffic by sitting in front of vehicles at ASLs. In conjunction with other suggestions that there was some element of disregard for cyclists because of their lack of importance (in terms of the hierarchy) and issues of inequality with regard to the lack of cyclist contribution to road maintenance and facilities etc. it could be inferred that some drivers may purposefully disregard cyclist facilities because they fail to respect cyclists.

### 2.3.6 Reactions to video clips of different scenarios findings

The research sessions consisted of general discussion of road user behaviour and interaction, which included looking at scenarios (in video and still photograph formats) which depicted situations where cyclists and other road users would come into contact and potentially conflict. Respondents were then asked to describe their likely behaviour and that of other road users (such as the average driver) in such situations.

The scenarios used in this section of the 'Qualitative Research' included:

- *narrow traffic lane (road works)* - This showed a cyclist travelling along a road narrowed to a single lane of traffic by road works. The cyclist was being followed by a line of vehicles apparently trying to judge whether it was safe to overtake;
- *pedestrian refuge* - This scenario was of a cyclist approaching a pedestrian refuge with cars overtaking him close to the narrowing;

- *roundabout* - Here two cyclists were travelling on a roundabout. A car at an entry to the roundabout pulled forward in front of the cyclists causing them to swerve around;
- *left-turning vehicle* - This showed a van driver turning left directly in front of a cyclist who was intending to go straight ahead;
- *advanced stop line with central cycle lane* - This showed a cyclists' advanced stop line (ASL) at traffic lights, which allows cyclists to position themselves ahead of the motor vehicles. This particular ASL had a central feeder cycle lane to allow cyclists to reach the right-hand lane;
- *advanced stop line with left-hand cycle lane* - This was an example of a mandatory cycle lane (on the left-hand side) feeding into an ASL facility at the traffic signals; and
- *cycle track crossing a side road* - This scenario showed a cycle track on the footway that crossed a side road junction. The side road had an additional set of give-way markings, intended to control road users and allow cyclists to continue uninterrupted across the side road. A car had crossed the first set of markings and was thus blocking the cycle track; cyclists used the main road in order to get past.

A key finding which should be noted was that, when commenting on the scenarios it was usually the behaviour of the cyclist that was criticised - no matter how small the misdemeanour. Few links were made between the cyclist's behaviour and any external influences that could be affecting their choice of behaviour; i.e. the respondents' comments indicated that they thought the cyclist's actions were inherent and dispositional behaviours. In contrast, the motorists' misdemeanours were excused or justified in terms of the situational influences. As this tendency seemed to continue across the groups and the individual depth interviews and was unprompted, it is unlikely that group dynamics had any significant effect on this finding.

Another overall finding from these scenarios was that people were not familiar with cycle lanes and advanced stop lines at traffic lights so they were not commonly understood. It seemed that implementation of cycle facilities is accompanied by little publicity, so how the facilities are to be used is little known.

According to the respondents' reactions to the scenarios, the majority of drivers claimed they would behave with consideration when coming into contact with cyclists within the different types of situation. How true this was is hard to say. Perhaps more interesting is the way in which drivers tended to criticise the behaviour of cyclists before that of the drivers depicted within each scene. This aligns with the psychological prediction of targeting of members of an 'out group'.

### 2.3.7 Summary of general tendencies (attitudes and behaviours towards cyclists)

When respondents were generally asked which road users they found irritating, until prompted, cyclists did not

particularly feature in discussions. This would tend to contradict the view of some cyclists that drivers habitually adopt an aggressive posture towards them. Only when prompted were drivers prepared to discuss cyclists at all, although once initiated, discussion showed attitudes towards cyclists and cycling were generally negative for the majority of respondents (as seen during both the hierarchy exercise and through the drivers' first impressions of cyclists).

For the purposes of this research project, it was necessary to direct respondents to particularly focus attention on their opinions of and reactions to cyclists. The reporting on this research may create the impression that drivers' opinions of cyclists were particularly negative, in relation to views of other road users, however this is not intended and the context of the responses and data should always be remembered.

The vulnerability of cyclists was a concern expressed by many and had two aspects:

- with regard to a fear of injuring the cyclist in an accident; and
- with regard to the damage that could be caused to an involved vehicle and the ultimate liability (no insurance for cycles).

Professional drivers were undoubtedly the most negative in their views towards cyclists. Those driving larger vehicles in particular (HGVs and buses) were less accepting of cyclists as legitimate road users, due to lack of insurance, a lack of financial contribution (no road tax), and a lack of some sign of proficiency (no licence or test certificate). These respondents tended to be of the opinion that cyclists should not be on the road at all. The slowness of cycles was frustrating for those with time pressures on their jobs (both goods and passenger carriers). The attitudes and behaviour of cyclists was seen to exacerbate this frustration. Cyclists were described as being arrogant, especially when they were seen to be flouting the rules of the Highway Code (jumping red lights, riding on footways, riding the wrong way along a one-way street), and 'getting away with it', but also when they were seen to be acting irresponsibly (coming up the inside of a vehicle, changing lanes or direction without signalling or checking behind).

Unpredictability was also a criticism levelled at the cyclist from the majority of respondents. However, this stirred different reactions in different road user types. Women and those drivers who also cycled tended to sympathise with this unpredictability, understanding or speculating on the difficulties that cyclists were perceived to face:

- lack of consideration from other road-users;
- difficult road conditions;
- lack of visibility etc.

In contrast, professional drivers and some male domestic drivers tended to blame the cyclist for not knowing what he was meant to do, apparently through a lack of proper training and the absence of any obligatory cycling test. These groups also felt that cyclists were not responsible for the consequences of their actions, as they did not pay insurance and were generally free from enforcement, and so

did not care about their behaviour. As previously mentioned there was no recognition of the fact that cyclists pay general taxes, may have cars and therefore pay road tax and that some cyclists do in fact hold insurance.

#### *Cyclists and non-cyclists*

Whether a respondent cycled or not, not surprisingly, had an important effect on responses and attitudes. Those who were cyclists were in the favourable position of being able to see things from both the cyclist's and the driver's point of view. These respondents were better able to distinguish between different types of cyclists, separating the good from the bad. Non-cyclists, on the other hand, were generally guilty of linking all cyclists to the same (usually negative) behaviour by association. This phenomenon is typical of the psychological tendency to regard members of a group as more similar to each other than is actually the case (as documented by Tajfel and Turner, 1986).

On the whole, however, the attitudes of those who cycled did not vary significantly from those who did not cycle. They tended to see things from the driver's perspective and could be just as negative about cyclists as other drivers who were non-cyclists.

Cyclists therefore tended to have similar views to most other non-cycling domestic drivers. It was non-cycling professional drivers (as mentioned above) that tended to hold more extreme views. Nonetheless, those drivers who cycled did have greater insight than other drivers did in some aspects. For example, they, not surprisingly, tended to know more about cycling facilities and how they operated. When looking at the scenarios, they could rely more on personal experience and talk about how they had reacted in real life. They could identify with such issues, as they knew that they were more commonplace than other non-cycling-drivers thought (such as being 'cut-up' by a motor vehicle). They were more realistic when it came to how they expected cyclists to react and behave in cycle lanes.

#### *Group dynamics*

As in all research studies, it is noted that the methodology used can have an effect on the results. Possible influencing of results may have occurred in the following ways:

- being in a group of peers can encourage 'posturing' and subservience whereby more dominant members' views are taken up by the less confident majority who do not wish to appear stupid or admit to an unpopular viewpoint.
- conducting a lengthy discussion on a similar topic can also affect opinions. Boredom of repeating opinions can in some cases lead to respondents saying anything to placate the moderator. However, this cannot be attributed to where respondents were assessing the different scenarios (video clips) as the criticism of cyclist behaviour was common across all groups and most individual depth interviews.
- a related factor was the way in which the stimulus materials used was different in the groups compared to the individual depth interviews. The fact that stills of a particular point in the scenario were shown in the



individual depth interviews, whereas group respondents were commenting on the wider situation shown on video, affected respondents' perceptions of what was going on in the scenario and therefore their opinions of driver and cyclist behaviour.

However, it should be noted that the true effect of group dynamics cannot be categorically accepted or denied. As with all elements of qualitative research, interpretation and supposition are major factors.

## 2.4 Findings from the 'Qualitative Research' phase

The eight group discussions and twenty individual depth interviews provide a detailed account of the attitudes and behaviour of drivers, both towards driving generally and specifically towards cyclists. Some of the main points to emerge are:

- cyclists do not feature amongst the main concerns of drivers;
- when asked about cyclists specifically, most drivers had a low opinion of cyclists;
- professional drivers have a lower opinion of cyclists than domestic drivers;
- driver annoyance with cyclists seems to be greater in congested conditions;
- drivers think that cyclists are unpredictable and ignore the Highway Code;
- drivers are inclined to criticise cyclists for relatively minor matters and to overlook or excuse driver transgressions;
- vehicle size (and relative danger) is considered an important determinant of driver behaviour;
- cycle facilities seem to make drivers more aware of cyclists but are often criticised; and
- on the whole, those drivers who cycle seem to have a better appreciation of the issues but still adopt a driver's perspective towards cyclists.

## 2.5 Findings in relation to social psychological theory

From a social psychological perspective, analysis of the 'Qualitative Research' points to two key conclusions.

Firstly, to the limited extent that drivers perceived cyclists as posing problems, the main cause for concern was the apparent unpredictability and 'difference' of cyclists' behaviour. This left drivers unsure of how to respond. There were hints that drivers responded by veering between caution, on the one hand, and incaution born of frustration and pressure from other drivers, on the other. In terms of the 'Theory of Planned Behavior', the problem was not primarily with drivers' attitudes towards cyclists (these were not unduly negative), but with drivers' perceived behavioural control when interacting with cyclists. This was exacerbated by what drivers considered to be an important 'social norm' governing road use, namely not slowing down (and thereby inconveniencing) following traffic any more than absolutely necessary.

Secondly, the underlying unpredictability of cyclists' behaviour was seen by drivers as stemming from the

attitudes and limited competence of the cyclists themselves, rather than from the difficulty of the situations that cyclists are often forced to face on the road (i.e. drivers made a dispositional rather than a situational attribution). Despite their own evident difficulties in knowing how to respond, drivers never attributed these difficulties to their own attitudes or competencies, nor did they do so in relation to other drivers (i.e. they made a situational attribution about their own and other drivers' behaviour). This pattern of assignment of responsibility is characteristic of how people perceive the behaviour of those they consider to be part of the same social group as themselves, versus those seen as part of a different social group (see Pettigrew, 1979). In other words, drivers saw cyclists as an 'out group', and blamed them accordingly for what was seen as negative behaviour, whilst exonerating members of the 'in group', namely themselves and other drivers.

## 3 Quantitative Research (Phase Two)

The Quantitative phase of the research aimed to provide statistical reinforcement and further insights to the conclusions of the 'Qualitative Research'. A twenty-minute face-to-face questionnaire was designed and then conducted with 620 subjects from five different areas of the country. The regions used were five of those used during the 'Qualitative Research' phase:

- York;
- Hull;
- Leamington Spa;
- Camden; and
- Bristol.

In each of the five areas, the composition of the sample of respondents was the same, in terms of:

- age;
- driver type;
- gender;
- working status; and
- income.

Thereby, meaningful comparisons could be made between the regions.

### 3.1 General perceptions of other road users

In order to gauge the 'annoyance factor' of cyclists relative to other road users, respondents were asked to cite three categories of road user that annoyed them. Across the five areas surveyed, taxis were cited by 47% of the sample as annoying. Annoyance with taxis was particularly high in Hull, where 68% of respondents included taxis in their selection of three types of annoying road users. Overall, 37% of those surveyed stated that buses/coaches annoyed them and this was fairly constant across the five surveyed areas.

Cyclists appeared as the third most commonly identified annoying road user group, being specified by 30% of respondents. Annoyance with cyclists was highest in Hull

where 37% of respondents specified cyclists in their selection of annoying road users. In contrast, only 26% of respondents from Leamington Spa included cyclists as an annoying road user group.

While vans and lorries were identified by 26% and 25% (respectively) of the sample's respondents as being annoying road users, annoyance with these groups was particularly high in Camden: 35% of Camden's respondents identified vans in their selection of three annoying road users and 34% identified lorries.

Cars were identified least frequently amongst the selections of annoying road user groups, being identified by only 13% of respondents. From a psychological perspective, it is interesting to note the low citing of car drivers as annoying. This pattern is consistent with a well-established inclination to regard the behaviour of 'out group' members more negatively than the behaviour of 'in group' members.

### 3.2 Reasons for the perceived annoyance of cyclists

The 'Qualitative Research' revealed that, when prompted, drivers generally hold negative perceptions of cyclists. In order to explore this matter further during the face-to-face interviews, respondents were asked to give reasons why cyclists annoyed them. Statistically, the major irritant is the cyclists' weaving in and out of

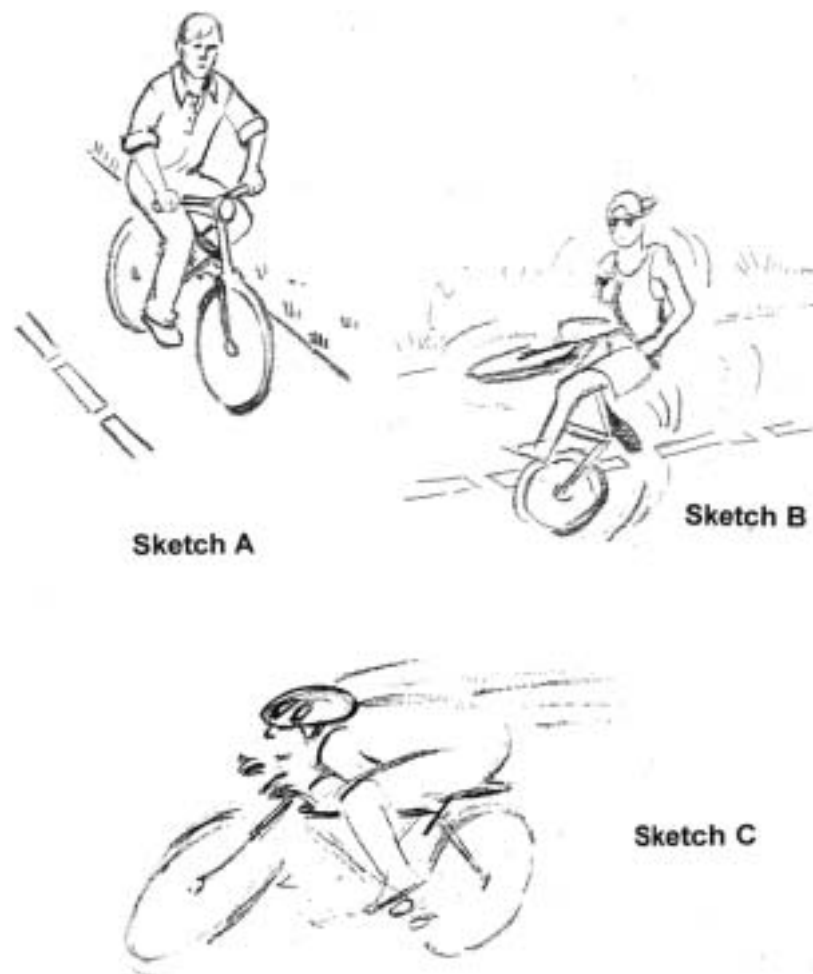
traffic, as identified by 29% of respondents. However, a quarter of the sample (25%) cited a lack of proper signalling, and approximately one fifth (22%) said that cyclists annoyed them because they 'get in the way'. Approximately one fifth of respondents (19%) identified that cyclists' ignorance of the Highway Code was a factor in their annoyance. A greater proportion of respondents from Hull cited each of these reasons for annoyance than was observed in any other of the surveyed areas.

The unpredictability of cyclists only featured as the sixth most frequently cited reason for their causes of annoyance, being only mentioned by 15% of respondents.

This section of the research indicates that drivers find instances of cyclists not adhering to road rules, thereby acting 'differently' from other road users, the greatest factor in the general annoyance of cyclists, particularly when those actions are seen to inconvenience drivers.

### 3.3 Perceptions of cyclist types

Respondents were shown three images of different cyclists, arbitrarily named 'everyday', 'stunt' and 'professional' cyclists (although respondents were not provided with these titles on the cartoons). Respondents were then asked which (if any) of the three they would give more space to, slow down, or treat with more caution when overtaking.



**Figure 1** Images shown to respondents to illustrate cyclist types

Drivers consistently awarded space, speed reduction and more caution to the stunt cyclist than to the professional cyclist or the everyday cyclist (although the differences between the everyday cyclist and professional cyclist were marginal). It was also found that, with the everyday and professional cyclists, drivers were more likely to concede speed than space and more likely to concede space than caution.

Similar proportions of all driver types said they would drive more cautiously, slow down and give more room when overtaking the stunt cyclist – the general impression being that this cyclist is less predictable and therefore warrants special attention. Professional drivers of larger vehicles were more likely to drive more cautiously when overtaking any of the three cyclists than other driver groups. This ties in with the ‘Qualitative Research’ in which drivers of larger vehicles commented on their vehicle bulk and concomitant lack of manoeuvrability, which would necessitate greater caution when dealing with cyclists.

With respect to the researched ‘Reasons for the perceived annoyance of cyclists’ (Section 3.2), even though drivers may award more caution, space and speed reduction for the stunt cyclist, it may also be this cyclist who causes the most annoyance to drivers because of their ‘different’ behaviour and perceived unpredictability.

### 3.4 Driving situations

In order to investigate the links between driver attitudes and behaviour in relation to drivers encountering cyclists on the roads, respondents were shown photos of two separate scenarios and asked a series of questions.

#### 3.4.1 Scenario One: Pedestrian refuge



**Plate 1** Cyclist approaching a pedestrian refuge

Respondents were shown a photo of a cyclist approaching a pedestrian refuge with a car behind. The road is narrow due to the refuge. Respondents were asked to imagine they were driving the car and had been travelling at the 40mph speed limit.

When asked how they would try to deal with the cyclist, three-quarters of respondents reported that they would

slow down and wait behind the cyclist. A quarter reported that they would check if there was enough room to overtake, then do so, whilst only a tiny minority (1%) said they would attempt to overtake even if room were tight.

Analysis by driver type reveals some subtle differences in driving behaviour. Professional drivers of larger vehicles were more likely than other drivers to say that they would act more cautiously (86% reported they would slow down and wait behind the cyclist). The responses of professional drivers of smaller vehicles, in contrast, indicated this group was slightly less likely than other drivers to act cautiously, and slightly more likely to check there was enough room to overtake and then do so (34% of professional drivers of smaller vehicles chose this option).

Area analysis reveals similar responses from each of the areas with few significant differences. However, it appears that drivers in Leamington Spa may act less cautiously where 61% said they would wait behind the cyclist, compared to an average of 78% across the other areas.

The second question about the scenario related to perceived behavioural control (identified as a key factor in the ‘Theory of Planned Behavior’), and respondents were asked what might stop them carrying out their plan. 38% of respondents stated that ‘nothing’ would stop them from carrying out their plan and 34% of respondents stated that ‘the behaviour of the cyclist’ could change their actions. Around a quarter of respondents (26%) mentioned that the behaviour of other drivers would cause them to change their own behaviour. This indicates that drivers can regard themselves as trying to adhere to cautious behaviour around cyclists as an accepted response to the situation and yet still feel themselves to be pressurised by other drivers into behaving incautiously. This suggests that the perceived ‘social norm’ legitimises incautious behaviour, but leaves individual drivers free to attribute the cause of that behaviour to external influences rather than to their own attitudes.

Responses to the second question were generally consistent between areas. However, the opinions of drivers in Leamington Spa again varied somewhat from the average response. Thus, drivers in the area were less likely to cite that the ‘behaviour of the cyclist’ could change their actions (22% versus an average of 37% from the other areas) and more likely to say that ‘conditions on the road ahead’ could be an influence (16% versus an average of 4% from the other areas).

### 3.4.2 Scenario Two: Advanced stop line



**Plate 2** Advanced stop line for cyclists

A second photo scenario asked respondents to report how they would behave at traffic lights with an advanced stop line for cyclists. In this scenario drivers were much more united about what they would plan to do and there was less variation of response. A strong majority of 90% reported they would wait behind the first stop line. 4% of respondents said that they were not sure about what they were supposed to do.

Asked what might affect their choice of position at the lights, over half of respondents (53%) said ‘nothing’. However, a quarter (25%) said that the presence of cyclists at the lights might affect their choice of position, while around a tenth (13%) said that the behaviour of other vehicles would influence their decision.

Area analysis showed little variation in responses. However, respondents in Bristol were less likely than other people to say that nothing would affect their choice of position (41% compared to an average of 56% over the other areas), and more likely to say that the presence of cyclists would influence their position (42% compared to an average of 21% over the other areas).

### 3.4.3 Drivers’ perception of the average driver

For both the ‘Pedestrian Refuge’ and ‘Advanced Stop Line’ scenarios, respondents were asked ‘what would a typical or ‘average’ driver do in this situation?’ This question was devised in order to monitor the perceived ‘social norm’ and investigate its effect on driving behaviour.

In both photo scenarios there was a ‘correct’ response, dictated by the Highway Code, and the majority of respondents (75% for the ‘Pedestrian Refuge’ and 90% for the ‘Advanced Stop Line’) could identify this response in each case. However, when asked how the average driver would behave, respondents attributed a high level of driving deviancy. Many drivers appeared to see the average driver as more maverick and less law-abiding than himself or herself. This finding can be expanded to gain understanding of the perceived ‘social norm’ component of the ‘Theory of Planned Behavior’. When respondents

claimed that other drivers would behave with substantially less caution and consideration than they would themselves, this is readily interpretable in terms of what is called a ‘norm positioning’ effect (see Lamm and Myers, 1978). This effect occurs when people identify the norm for a particular behaviour and attempt to boost their self-esteem by adopting a position that is ‘even more normal’ (i.e. which makes them seem to be a shining example of the normative behaviour in question). Since drivers are probably aware from their own observation that the norm for driver behaviour towards cyclists is a somewhat impatient caution, they are probably positioning themselves with a rather more tolerant and global caution than they perceive to be typical of drivers as a whole.

An important point following from this analysis is that it seems unlikely that drivers’ own behaviour actually *is* as cautious as they claimed it to be, since the norm positioning effect entails adoption of a somewhat artificial stance. In other words, the true ‘social norm’ for behaviour around cyclists is probably less tolerant and less cautious.

### 3.5 Comparative perceptions of cyclists and drivers

The effect of attributing less law-abiding behaviour to others (as revealed through the ‘Drivers’ perception of the average driver’ findings presented in Section 3.4.3) is also shown when respondents were asked the extent to which cyclists and drivers obey the Highway Code. Indeed, having established that many respondents think other drivers are less law-abiding than they are, the findings suggest that they think that cyclists are worse still. When asked how much of the time cyclists and drivers obey the Highway Code, half of the respondents (49%) judged that drivers obey the Highway Code most of the time while only 30% of respondents thought that cyclists obey the Highway Code most of the time. Only 3% of the respondents said that drivers obey the Highway Code rarely or never compared to nearly a fifth (16%) who judged that cyclists obey the Highway Code rarely or never.

It is interesting to note that 31% of the respondents involved held two perspectives, being both drivers and regular cyclists. (For the purposes of analysis, ‘regular’ cyclists were defined as those who had ridden a bicycle within the year 2000, and did so with a minimum frequency of two or three times a month.) The results from this question showed that drivers who cycled regularly held similar views to non-cyclists or irregular cyclists regarding compliance with the Highway Code.

To better understand respondents’ views regarding cyclists’ and drivers’ *lack* of adherence to the Highway Code, the interview allowed respondents to provide feedback. This was recorded as a verbatim response by interviewers and coded at a later date. Respondents conceded that some drivers are aggressive (21%) and drive above the speed limit (40%). Against this are the infractions exclusive to cyclists – riding on the pavement (19%), without lights (14%), irresponsibly (7%), and not keeping to single file (4%). Forms of road ‘deviance’ practised by both drivers and cyclists were stated to include: abuse of rules, taking incorrect road position, not

signalling, ignoring rules, behaving unpredictably, poor observation, poor knowledge of the Highway Code, and poor attitude. However, amongst these, the abuse of rules, incorrect road position and behaving unpredictably were seen as being more prevalent amongst cyclists than drivers.

The findings from this section illustrate a strong tendency of drivers to regard cyclists as an 'out group' and therefore to regard the behaviour of the 'out group' members more negatively than fellow 'in group' members.

A further point to note is that many of the transgressions which drivers identified as being perpetuated by cyclists almost certainly have some basis in reality, in the sense that some cyclists will have been observed behaving in this way at some time (e.g. riding on pavements or with no lights). However, there is a strong psychological tendency to over-generalise from the behaviour of *individual* members of an 'out group' to the behaviour of members of the 'out group' *as a whole*. Thus, occasional confirmations of inappropriate behaviour on the part of cyclists would tend to reinforce to an unwarranted extent drivers' already negative perceptions of this group's behaviour. (See Tajfel and Turner, 1986, on the tendency to regard members of a group as more similar to each other than is actually the case.)

Drivers' perceptions of drivers' observance of the Highway Code is relatively consistent across driver types and areas. Drivers' perception of cyclists' observance of the Highway Code was also relatively consistent across driver types but did vary across areas. Hull respondents stand out as more critical of cyclists with 25% stating that cyclists rarely obey the Highway Code, compared with an average of only 14% over the other areas.

### 3.6 Giving priority to cyclists on the road

Respondents were asked 'How strongly do you agree or disagree that cyclists should be given more priority on the roads, even if this sometimes causes inconvenience for drivers?' This question was intended to assess the attitudes of drivers towards cyclists as a mode of transport and to see to what extent they supported the idea of promoting cycling. The objective of the question was partly to ascertain drivers' views on this policy issue but mainly it was to see whether drivers who supported the idea of encouraging cycling were more likely than other drivers to find cyclists less annoying and to behave more considerately towards cyclists.

The majority of respondents (55%) agreed or strongly agreed that cyclists should be given more priority on the roads, even if this sometimes inconveniences drivers, whilst only 28% disagreed. Drivers who earlier had identified cyclists as most annoying were considerably more likely (63%) than drivers who did not find cyclists annoying (23%) to disagree that cyclists should be given more priority. Not surprisingly, drivers who were regular cyclists were more likely than non-cyclists to agree that cyclists should be given priority, but the difference was only 13% - again reinforcing the overall similarity between opinions of regular cyclists and non-cyclists or irregular cyclists.

The responses to this question varied by area. It was found that 65% of drivers in Camden agreed that cyclists

should have greater priority on the roads compared to only 45% of drivers in Hull.

### 3.7 Suggestions for improving the driver/cyclist relationship

Respondents were asked for their suggestions for improving the driver/cyclist relationship – both with regard to what cyclists could do on a day-to-day basis and more generally.

Response categories were grouped into those requiring greater regulation, education or control of cyclists, those demanding greater/better provision of cycling facilities, and those requiring greater regulation, education or control of drivers.

While the most frequent response (41%) was to suggest more specialist cycling facilities, e.g. cycle lanes, there is an overall impression that respondents thought improvements would be gained via greater control and education of cyclists, rather than through the education or control of drivers. For example, while 32% of respondents felt that better education of cyclists would improve the driver/cyclist relationship, just 19% thought that better education of drivers was required. Further, 11% of respondents were in favour of better police enforcement of the Highway Code with cyclists, compared to just 4% who thought similar action was required with drivers. The observed emphasis on changes for cyclists rather than changes for drivers shows the classification of cyclists as an 'out group', as predicted through the psychological theories.

On a day-to-day basis, respondents' suggestions for what cyclists could do to improve the driver/cyclist relationship related to more predictable behaviour and greater awareness – 49% were in favour of clear and timely signalling, whilst a third cited correct road position (35%) and a similar proportion cited more awareness of other road users (31%). However, visibility was also a key issue – 34% thought the relationship would be improved by cyclists wearing more visible clothing, whilst a fifth (18%) thought that the use of lights at night would be helpful.

### 3.8 Awareness of cycling facilities

In order to assess levels of knowledge of various cycling facilities, respondents were shown three photographs depicting different facilities. Initially, two photographs were shown – one depicting an advanced stop line and the other a mandatory cycle lane. In both cases, the majority of respondents said they had noticed the cycling facilities on the roads they used, although a larger proportion of respondents had noticed cycle lanes than advanced stop lines.

When asked what they thought about advanced stop lines and cycle lanes, there were three high frequency responses:

- safer/good for cyclists;
- keeps different road-users separate; and
- safer/good for motorists.

Both cycle provisions were seen as having high utility for all road users but as being primarily beneficial to cyclists.

When asked how they found out about what to do when they came across both facilities, the majority of respondents reported that they guessed or assumed (70% in relation to stop lines, 72% in relation to cycle lanes). This clearly highlights deficiencies in the education and awareness schemes surrounding the introduction and correct use of these features.

As a final assessment of driver knowledge of cycling facilities, respondents were shown two photographs – one depicting a mandatory cycle lane and one showing an advisory cycle lane. Neither of the photographs was labelled. The interviewer asked whether they knew how the rules for the two cycle lanes differed. 43% of the sample gave the correct answer, i.e. that drivers must not drive into a mandatory cycle lane, but may drive into an advisory cycle lane. However, 27% gave the wrong answer, while 30% did not know the rules for each. This again may indicate education shortages, as understanding of the subtleties is sometimes vital to the success of and compliance with road designs.

### 3.9 Findings from the ‘Quantitative Research’ phase

The ‘Quantitative Research’ phase has generally confirmed and quantified the findings of the earlier ‘Qualitative Research’ phase. It has also provided a much more precise picture of driver attitudes, intentions and behaviour. Amongst the key findings are:

- cyclists are not a major annoyance to most drivers;
- drivers are not ‘anti-cyclist’ but, when prompted, are critical of cyclists’ behaviour;
- drivers’ main concerns regarding cyclists are ignoring the Highway Code rules, acting ‘differently’ from other road users and unpredictability, causing uncertainty as to how drivers should react;
- professional drivers of larger vehicles are most critical of cyclists;
- drivers see cyclists as an ‘out group’ and therefore have a tendency to overly criticise cyclists while exonerating errors made by drivers (the ‘in group’);
- most drivers consider themselves more considerate than their perception of the ‘average driver’;
- drivers who cycle or have pro-cycling views are less critical of cyclists and drive more considerately, but the differences are not large;
- drivers’ (lack of) perceived behavioural control is a more significant influence on driver behaviour than attitudes;
- drivers know what they ‘should do’ but feel pressured by other drivers into adopting the perceived ‘social norm’ of moderate impatience towards cyclists; and
- many drivers were ignorant of the rules for some common cycle facilities.

### 3.10 Findings in relation to social psychological theory

From a social psychological perspective, analysis of the ‘Quantitative Research’ points to two key conclusions surrounding driver/cyclist interactions of the road.

The first is the tendency of drivers to regard cyclists as an ‘out group’, with all the negative perceptions of their behaviour that this entails. This allows them to continue to blame cyclists’ apparent unpredictability on the cyclists themselves. It also prevents them from considering the problems that the traffic environment forces on cyclists (of which they, as drivers, are themselves a part) – a viewpoint which might lead to rather greater tolerance and understanding. The second problem is with the perceived ‘social norm’ of moderate impatience towards cyclists, a norm which sanctions behaviours which the majority of drivers (wishing to see themselves in a positive light) would probably regard as regrettable in an ideal world.

With regard to the ‘out group’ issue, it should be noted that increasing the overlap between drivers and cyclists by encouraging more drivers to take up cycling is unlikely to help significantly. Although there is some evidence that cyclist-drivers have a more positive view of cyclists than non-cyclist-drivers, and behave more considerately towards them, the differences were not large. This is not entirely surprising, since another strand of theorising about group and social identity, ‘Self-Categorisation Theory’ (Turner, 1987), holds that people identify themselves with the group or category which is most salient at a given point in time. In other words, when people are acting as drivers, they typically think of themselves as drivers in compartmentalised fashion, irrespective of the groups that they belong to at other points in time.

## 4 Testing of the Research (Phase Three)

This phase was essentially intended to investigate, in greater depth, some of the qualitative and quantitative findings, of Phases One and Two. Virtual Reality simulations were used to test the effect on driver attitudes and behaviour of changes to the road infrastructure and of different behaviours on the part of cyclists. Following the completion of the Virtual Reality testing, some preliminary work was conducted into establishing what types of interventions might be effective in breaking down drivers’ dispositional interpretation of cyclists’ behaviour.

### 4.1 The Virtual Reality testing

The Virtual Reality testing was designed to investigate in more detail the degree to which the interaction of combinations of different physical features and different cyclist behaviours influence driver responses. A number of Virtual Reality (VR) ‘Worlds’ were constructed in order to allow these conditions to be isolated and tested under controlled and safe circumstances. Forty subjects drove through these Worlds and their attitudinal and behavioural responses were recorded. The use of this equipment in previous experiments has suggested that it elicits behaviour from drivers that correlates to their behaviour when driving in reality on straight roads, although it is less accurate in representing their real behaviour around corners (Baruya, Finch, Paulo and Woodgate, Virtual Reality as a Tool for Safety Research). Accordingly, the Worlds were constructed so as to scrutinise driver



behaviour when encountering physical features and cyclists on a straight road.

#### **4.1.1 The Worlds**

The selection of the Virtual Reality Worlds emanated from the key findings of the 'Quantitative Research' (Phase One) and the 'Qualitative Research' (Phase Two) of this study. The Worlds replicate the scenarios where drivers cited 'difficulties' in dealing with cyclists.

There were three types of infrastructure tested, both singly and, where possible, in combination:

- a normal road with no unusual features;
- the same 'normal' road with the addition of a red-surfaced advisory cycle lane;
- the same 'normal' road with the addition of a traffic island, causing a road narrowing; and
- the same 'normal' road with both a red-surfaced advisory cycle lane and a traffic island.

In addition, the subjects encountered three types of cyclist behaviour:

- a cyclist travelling straight ahead along the road to the left hand side of the carriageway;
- a cyclist travelling straight ahead along the road in the centre of the carriageway. This cyclist was positioned so that they were outside the area designated as an advisory cycle lane in the Worlds where a lane existed; and
- a randomised 'wobbly' cyclist, who veered back and forth at random within fixed parameters.

A scenario was created from a combination of each physical feature with each cyclist behaviour, to generate twelve different Worlds. Each of these Worlds represented a variation on the same base World. All involved the driver proceeding along a straight rural road before travelling around a bend and entering a built-up area. Within the built-up area the driver had to negotiate a parked goods vehicle and then, a few seconds later, encountered the conditions specific to that World. For the purpose of analysis, the data relating to the section between the goods vehicle and the position of the road narrowing, when present, were extracted.

The driver began driving in each World at a point on the rural road, with the cyclist's initial position immediately beyond the parked goods vehicle in the built-up area. The forward speed of the cyclist was linked to that of the driver's vehicle. The cyclists travelled at three twentieths of the vehicle's speed unless the vehicle slowed to below 5mph, in which case the cyclists would continue to travel at a fixed rate. This link was created in order to ensure that the cyclist was encountered sufficiently close to the road narrowing to require the driver to make a decision as to whether to pass the cyclists or to remain behind the cyclist until the narrowing was passed. Had this link not been present those subjects who drove significantly faster than average would have passed the cyclist long before the narrowing was encountered.

Details of the Virtual Reality equipment are included in Appendix B.

#### **4.1.2 Data collection**

Subjective data, were collected through the subjects completing three questionnaires:

- a 'before' questionnaire was completed prior to any driving in the test Worlds. This gathered demographic and personal information relating to driving experience, cycling experience and experience of driving professionally;
- a 'during' questionnaire was completed by each subject immediately after each of the twelve Worlds had been driven through. This questionnaire sought the subject's view on the difficulty of the scenario encountered, the consideration of the cyclist and themselves as a driver and their assessment of how the parties should have behaved; and
- an 'after' questionnaire was conducted with each subject following final completion of the twelve Worlds and the twelve 'during' questionnaires. This questionnaire incorporated a test question to establish whether the subject had an unduly negative or positive attitude towards cyclists that may have influenced their responses in the tests. This questionnaire also gave respondents the opportunity to make any additional comments.

Data on behavioural responses were primarily collected through the VR equipment's automatic recording of numerical data at the end of each second. These data related to:

- the position of the car;
- the use of the accelerator; and
- the use of the brake.

From these data it was possible to calculate:

- the speed of the driver;
- the position of the cyclist relative to the driver; and
- whether the driver braked or accelerated.

These data were collected 120 times in the course of each World that was driven.

To validate the numerical data that was automatically recorded, the test operator also recorded key observations during the tests, that could then be compared with the data generated by the VR equipment.

#### **4.1.3 The sample**

A total of forty subjects completed the simulated drive through the twelve test Worlds. The sample was deliberately chosen to reflect the same proportions of gender, cycling experience, professional versus domestic drives as those samples of the public participating in the 'Qualitative Research' and 'Quantitative Research' stages of the project.

The subjects were all drawn from the TRL Driving Simulator database of Berkshire residents willing to participate in tests. Where it was possible to do so, preference was given to those whose previous experience of using the Driving Simulator suggested that they were relatively comfortable with using the equipment and controlling the 'vehicle'.

#### 4.1.4 The experimental procedure

Each subject initially spent approximately five to ten minutes familiarising themselves with driving the VR equipment in an immersion World. This World was different from the base World that was used in the tests and featured straight roads, bends and roundabouts. The subject was given as long as they wished to ensure that they were comfortable and able to control the virtual car to their own satisfaction.

After their ‘immersion drive’, each subject then completed the ‘before’ questionnaire.

Each subject then experienced the twelve Worlds. To confound ordering effects, which could result in a subject’s responses in any of the Worlds being affected by the conditions in the Worlds that they had already experienced, the order in which the twelve different Worlds were experienced was systematically varied.

After each World, the subject completed a ‘during’ questionnaire.

Following the completion of the twelfth ‘during’ questionnaire, the subject was then asked to complete the ‘after’ questionnaire.

#### 4.1.5 Questionnaire responses

The questionnaires issued to participants at the end of each trial were used to gauge drivers’ subjective reactions to the events presented to them. These related to four key issues:

- driver confidence in judging what the cyclist would do;
- how easy the driver found it to pass the cyclist;
- how considerate the driver felt the cyclist had been; and
- how considerate the driver felt they had been.

Drivers provided ratings against each of these key issues after completion of each World. The ratings were made on a nine-point scale, the lowest achievable score being one and the highest being nine, where one represents the lowest levels of confidence, ease and consideration and nine the highest.

#### Questionnaire responses: Effect of road type

The results of the effects of road types, given below, represent the responses of drivers to all the Worlds in which a given combination of highway features were present, regardless of the cyclist behaviour encountered in those Worlds.

There was considerable variation in participants’ subjective ratings, depending on what road features were or were not present in the scene. The best ratings all occurred when drivers experienced either a normal road or (even better) a road with a cycle lane. Drivers rated it significantly easier to pass the cyclist in the condition where a cycle lane was present, and they rated themselves as significantly more considerate in this condition too.

The lowest ratings were given where a refuge was added to the scene, thereby narrowing the road ahead, and creating the situation where the cyclist’s behaviour was most likely to impact on the driver. In this situation, the drivers reported their confidence in what they thought the cyclist was going to do decreased, and the perceived difficulty of overtaking him increased. The subject drivers were also much more likely to perceive the cyclist as inconsiderate (even though the cyclist’s behaviour was, in fact, constant within each road condition), and they also perceived themselves to be somewhat less considerate in this condition, though this effect was less marked. It is interesting to note the link between the situation where cyclists could most likely be perceived to be causing inconvenience to drivers and the corresponding drop in drivers’ perceptions of their own levels of consideration.

The negative effects of refuges were somewhat moderated if a cycle lane was also present in the scene. This significantly improved all the ratings except drivers’ perceptions of their own levels of consideration, which were constantly high. Nevertheless, the scores all remained much lower than in either of the conditions where refuges were absent altogether.

The consistency of the pattern described above is very clearly illustrated in Figure 2. The only significant deviation is in drivers’ perception of their own levels of

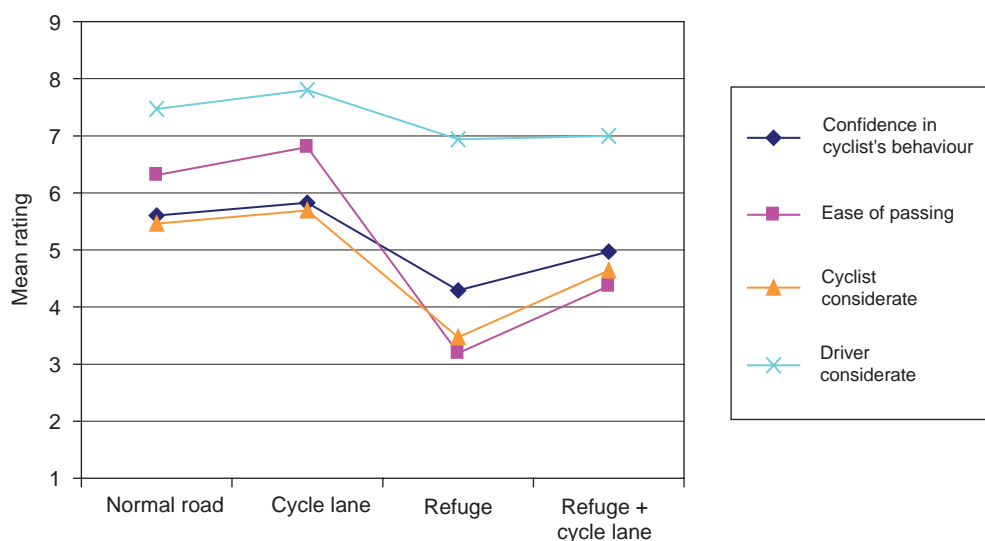


Figure 2 Mean ratings as a function of road type



consideration. This is mainly because drivers considered themselves to be highly considerate at all times. Out of a maximum possible score of nine, and with the possibility of going as low as one, drivers were unwilling to rate themselves lower than 6.9 in any of the conditions. Even so, their ratings were still significantly affected when they were required to drive on narrowed roads, underlining the extent to which this condition affected drivers.

The positive effect of cycle lanes and the negative effect of road narrowing can be particularly clearly seen through comparison of those ratings from trials where these features were either present or absent (i.e. ignoring all other factors). This analysis is presented in Figure 3. This shows how all four subjective ratings deteriorated significantly when a refuge was added to the normal road scene. Conversely, they show how the presence of a cycle lane significantly improved them (except for drivers' perceptions of their own levels of consideration). It seems that these features served to increase or decrease drivers' perceived ability to deal with traffic situations involving cyclists, and also affected how considerate they perceived the cyclist to be. The latter effect, it should be noted, is quite independent of how the cyclist actually behaved. Apparently, some of the difficulty that

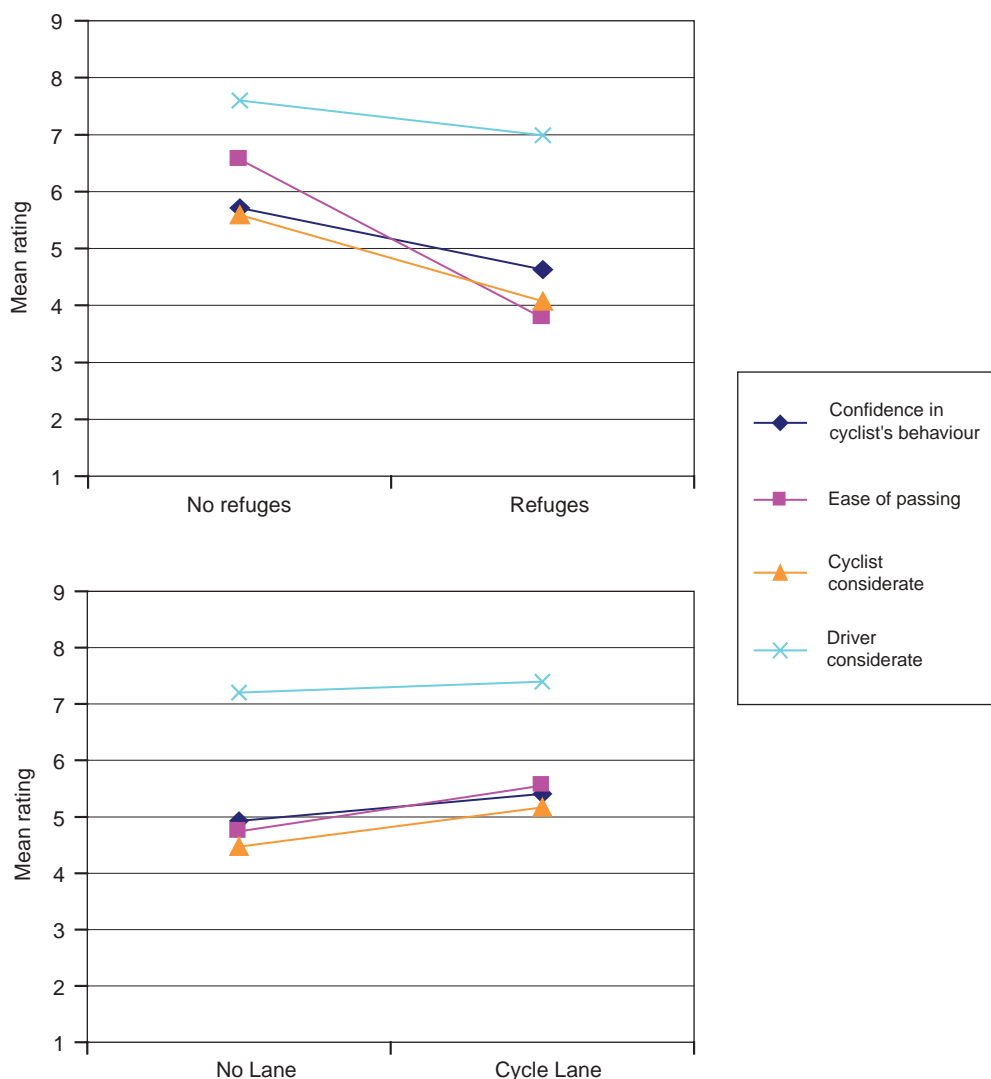
was actually attributable to the road conditions was psychologically transferred to the cyclist. This is symbolic of the general psychological tendency of drivers to view cyclists as an 'out group'.

#### *Questionnaire responses: Effect of cycling position*

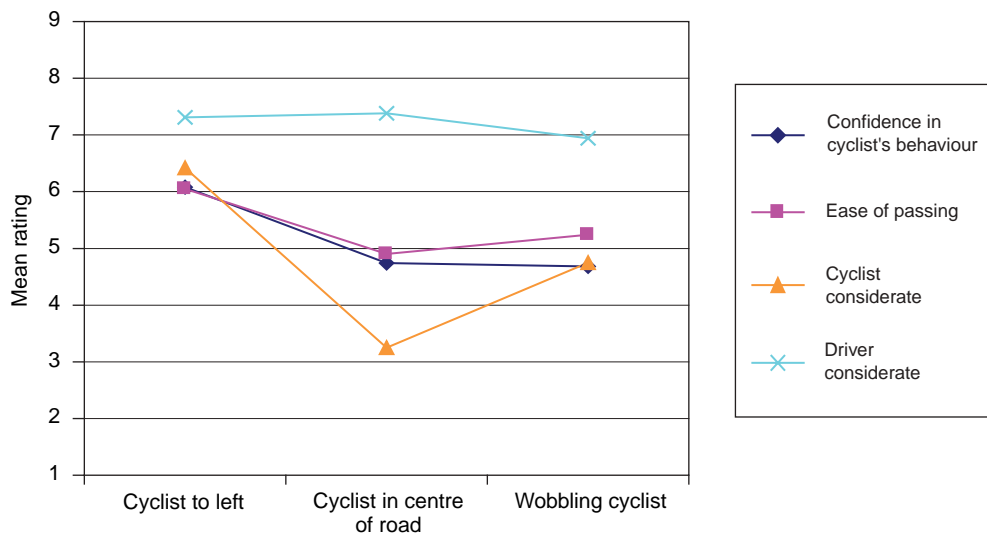
The effect of cycling position within the traffic lane was investigated by means of three conditions:

- where the cyclist kept to the left at all times;
- where the cyclist rode in the middle section of the road; and
- where the cyclist was 'wobbly', i.e. took a path that was both shaky and somewhat unpredictable, sometimes even cycling onto the footway.

The effects of these conditions on the subject drivers' subjective judgements are shown in Figure 4. It can be seen that, in all cases, drivers appeared much more comfortable when the cyclist kept to the left. This made them feel significantly more confident that they knew what the cyclist was going to do, and they judged it easier to get by. They also judged the cyclist to be much more



**Figure 3** Mean ratings as a function of the presence/absence of refuges and cycle



**Figure 4** Mean ratings as a function of cyclists' road positioning and behaviour

considerate if they stayed on the left, with a mean rating twice as high as when the cyclist held the centre of the road (6.4 versus 3.2, on a scale of one to nine, where nine represents the maximum consideration). The subject drivers' perceptions of their own levels of consideration were not affected by these variations, however. In fact, their personal rating never dropped below 7.2, and was not significantly affected by the different conditions.

The comparison between the 'wobbly' condition and the condition where the cyclist took up position in the centre of the road reveals some interesting findings. There was no significant difference in perceived driver confidence between the centrally positioned and the 'wobbly' cyclist and it was actually judged easier to get past the 'wobbly' cyclist than the one who maintained a central position on the road. Moreover, the latter was judged to have been significantly less considerate than the 'wobbly' cyclist, even though both affected how comfortably drivers felt they could deal with the situation.

This suggests that drivers saw the cyclist who held the middle of the road to be a 'lane hog' who was deliberately making life harder for them by refusing to move over. The 'wobbly' cyclist, on the other hand, may have been seen as merely inexperienced and therefore deserving of a certain amount of leeway. Also, the 'wobbly' cyclist was not always positioned in the middle of the road: sometimes they wobbled to the left and, on occasion, took to the footway. This means that drivers were presented with a larger number of opportunities to overtake in this condition than would be the case with a cyclist who remained within the central area of the traffic lane. This seems to have modified drivers' views of the cyclist, even if a 'wobbly' cyclist is intrinsically less predictable than one who cycles confidently.

#### *Questionnaire responses: Interactions between cycling behaviour and road type*

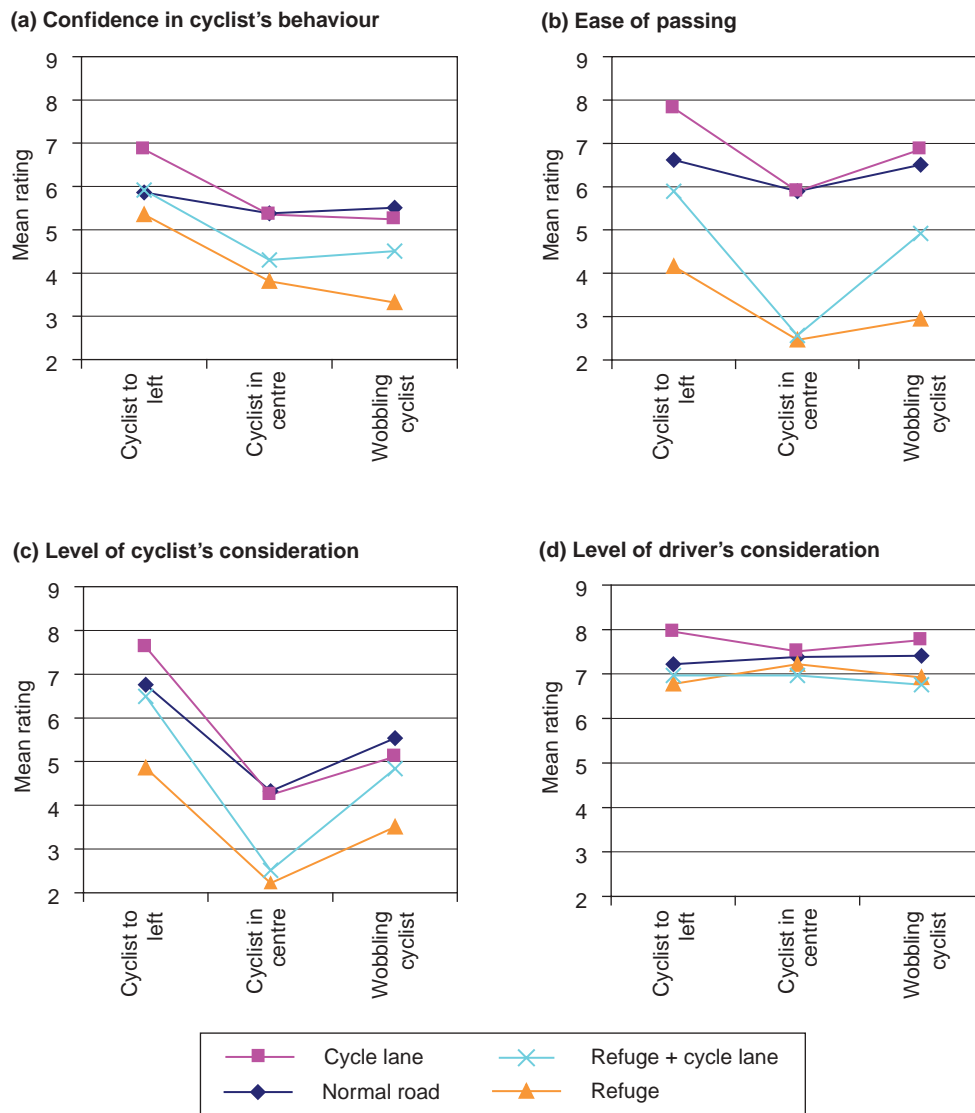
Given the effect that both road type and cycling behaviour had on drivers' judgements when considered separately, it was felt important to examine how these factors interacted

when combined. For example, although it is clear that the presence of a cycle lane had a beneficial overall effect on drivers' perceptions, on about two-thirds of the trials the cyclist was not actually using the lane. This raises the possibility that the beneficial effect of the cycle lane might be even greater on those trials where the cyclist had actually used it. Combining the physical provision of a cycle lane with the behavioural instance of a cyclist not using the lane allowed for analysis of the effect of cyclists not utilising specific facilities, and it could be investigated whether this further exacerbated drivers' negative reactions.

The interactions between the different road layouts and the different types of cyclist behaviour were examined for each of four subjective ratings (these rating categories correspond to those used for recording the subjective data previously):

- confidence in cyclist's behaviour;
- ease of passing;
- level of cyclist's consideration; and
- level of driver's consideration.

The relationships between all these variables are plotted in Figure 5. It can immediately be seen that, for driver confidence, level of consideration by the cyclist and level of consideration by the driver the lines follow essentially the same pattern irrespective of the type of road layout that was involved: there are no qualitative differences between them. This was confirmed by the statistical analysis that showed all the interactions to be statistically non-significant. This is particularly interesting in relation to the questions raised earlier: it seems that drivers' disapproval of cycling in the middle of the roads holds whether or not there was a cycle lane that the cyclist could have moved into. Their disapproval was not reserved for those cases where the cyclist could have cycled in a cycle lane but chose not to do so. Even where this option was not available, drivers continued to rate the cyclist low on consideration compared to the cyclist who chose to ride on the left close to the kerb. Similarly, while ratings were always high when a cycle lane was present, they did not



**Figure 5** Drivers' subjective ratings as a function of road layout and cyclist behaviour

rise disproportionately when combined with the cyclist who actually cycled within them.

The only interaction which approached statistical significance (and then only marginally) related to perceived ease of passing. It can be seen in Figure 5(b) that drivers judged it hardest to get past the cyclist occupying the middle of the road when the road ahead was narrowed by the refuge. The combination of these two factors seems to have affected drivers more than would be expected from the straightforward additive effect of the two variables. This is hardly surprising, however, since this combination would serve to minimise the space available for drivers to manoeuvre.

#### 4.1.6 Behavioural measurements

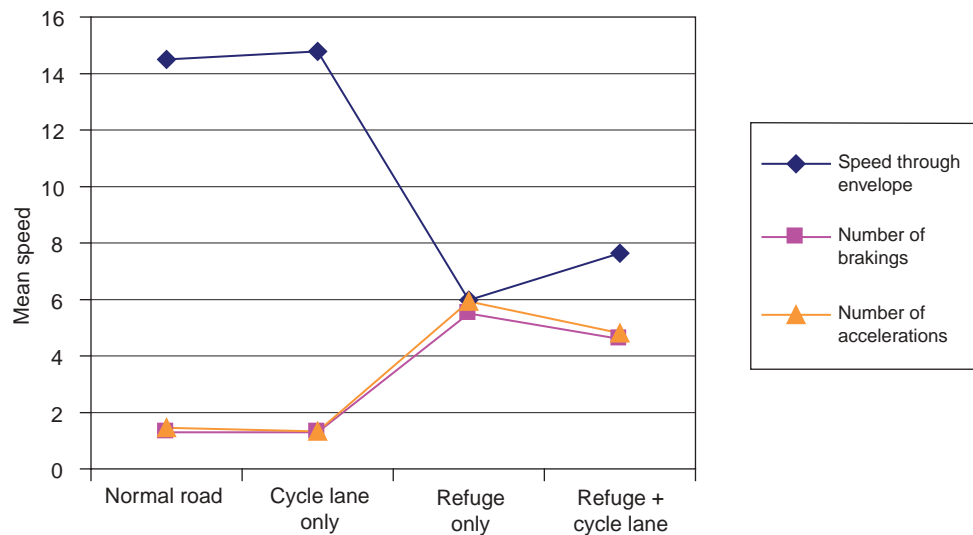
##### *Behavioural measurements: Effect of road type*

In addition to drivers' subjective responses to the scenarios, through the critical test section of each World, the following three characteristics were measured:

- the mean speed of the vehicle;
- the mean number of times drivers braked; and
- the mean number of times drivers accelerated.

Figure 6 illustrates the results as a function of the different road types and presents a clear picture. When driving on the normal road or the road containing a cycle lane, drivers maintained a fairly high speed relative to other conditions and made relatively few adjustments by using the brake or accelerator. On average, participants adjusted their speed only once or twice throughout the testing section, implying that they found the task relatively comfortable. By contrast, when a refuge was introduced, average speeds were greatly reduced. Indeed, the mean speed in this condition was less than half that when there was no refuge. In spite of this, drivers also spent much more time adjusting their speed. Approximately four times as many braking and accelerating movements were made in this condition as when the refuge was absent. As with the questionnaire data, these effects were statistically somewhat moderated when a cycle lane accompanied the refuge. However, mean speeds remained much lower, and the number of braking or accelerating movements much higher, than when the road was not narrowed.

These findings suggest that drivers found it considerably harder to execute an overtaking manoeuvre when a refuge



**Figure 6** Mean speed through critical test section, number of braking occasions, and number of accelerations as a function of road layout

narrowed the road ahead. Statistical analysis showed that responses across the group varied greatly and were far more disparate in the refuge situations than in the clear road scenarios. This suggests that the drivers had become uncertain as to how they should deal with the situation, generating a very much wider range of reactions as a result. These variations in driver behaviour are interesting to note with respect to the smooth and consistent driving that was identified as a key characteristic of ‘considerate’ drivers by respondents within the ‘Qualitative Research’ (Section 2.3.2).

#### *Behavioural measurements: Effect of cycling position*

The influence of cyclists’ road positioning on drivers’ subsequent behaviour was analysed. Similar trends to those reported above were found, though to a less marked extent. Thus drivers’ mean speed through the testing section of the Worlds was significantly decreased when the cyclist maintained position in the centre of the road and drivers also braked and accelerated more often in this condition. The effect was relatively small, however. In the case of the ‘wobbly’ cyclist, such trends were almost absent in terms of statistical significance. There was a tendency to drive more slowly in this ‘wobbly’ cyclist case but the effect was only just statistically significant and very slight (10.88 in this condition versus 11.91 where the cyclist stayed on the left). Moreover, drivers did not brake or accelerate more often when confronted by a ‘wobbly’ cyclist. It seems that drivers’ behaviour was somewhat less smooth and confident when the cyclist held the centre of the road than when they cycled to the left, which is consistent with their subjective reports. However, the ‘wobbly’ cyclist did not cause them to adjust their behaviour, except to slow down to the very slightest degree.

#### *Behavioural measurements: Interactions between cycling behaviour and road type*

To investigate the possibility that interactions between the variables might exist along lines similar to those discussed for the questionnaire data above, these interactions were

statistically analysed. All the interactions proved to be statistically non-significant. Thus it seems that the effects of cyclist behaviour applied more or less equally across the different road types, while the reported effects of road type were not reserved for conditions in which cyclists behaved in a particular manner but applied more generally. Since all the interactions were non-significant, they are not presented in graphical form.

#### **4.1.7 Relationship between the questionnaire responses and behavioural measures**

Overall, the data provide a coherent picture, with the behavioural measurements largely confirming drivers’ subjective assessments. Drivers reported having less confidence in the cyclists’ behaviour when refuges were present and also found it harder to get past under these conditions. This seems to be confirmed by the behavioural data where the frequent use of brake and accelerator suggests more hesitant and uncertain manoeuvring. Drivers also reported having more difficulty in dealing with the cyclist who kept to the centre of the road, something which particularly strongly affected their perception of the level of consideration displayed by the cyclist. The behavioural data were also consistent with these ratings, in that drivers did drive slightly more hesitantly in this condition, but the effect was not as marked as drivers felt and hardly justified their judgements of the consideration displayed by the cyclist. The latter judgements seem to reflect the cyclists’ ‘out group’ status at least as much as they reflect any real inconvenience caused to drivers. This is less true of the condition where a refuge was present because the combination could understandably give rise to concern in the drivers’ minds, even if their corresponding behaviour was not especially affected. Bearing in mind (the necessarily) somewhat artificial nature of the experimental situation and the unfamiliarity with the simulator, the emergent trends show an exceptional clarity and consistency. It is hard to believe that they do not reflect stable aspects of drivers’ behaviour

and experience that are strongly indicative of their real-world responses.

## 4.2 Video intervention

This phase of the research involved testing the effect of various interventions on drivers' views of the dispositional nature of cyclists' behaviour. The advantage of breaking down the dispositional attribution would be that it might encourage drivers to recognise the consequences of their own behaviour and also the influence of environmental factors on cyclist behaviour. This would provide drivers with a basis for predicting cyclist behaviour and addressing the lack of Perceived Behavioural Control experienced by drivers when encountering cyclists.

### 4.2.1 Methodology

A sample of 78 drivers was shown four video clips of encounters between drivers and cyclists and their qualitative responses to each video situation were recorded. The four video clips showed:

- *Clip One* - Drivers waiting behind, and subsequently passing, a cyclist at road works. As the first driver passed the cyclist, the cyclist wobbles into the coned area of the road works and then out again;
- *Clip Two* - Two cyclists are circulating on a roundabout when a car edges into the roundabout in front of the cyclists, causing them to swerve around the front of the car;
- *Clip Three* - At the point where a segregated cycle track meets a side road junction, cars waiting to turn out of the side road are blocking the track. A cyclist rides around the front of the cars, going out into the main carriageway, and then cuts back to rejoin the cycle track; and
- *Clip Four* - A cyclist is riding on the right hand side of a residential road (the clip is from the Netherlands, although the participants were not informed of this), a 'transit' style van turns right across the path of the cyclists, causing the cyclist to perform an emergency stop and almost fall from the bicycle.

The total sample was split into three groups giving three experimental conditions:

- *Control Condition* – This group simply viewed the video, with no interventions;
- *Empathetic Intervention* – Prior to viewing each video clip, the participants in this group were asked to imagine that they were the cyclist; and
- *Intellectual Intervention* – This group viewed the video clips after having read the 'Drive Safe, Cycle Safe' leaflet. This leaflet sets out to highlight to drivers how their behaviour may influence cyclists and also identifies some behaviours of cyclists that affect drivers.

All the participants initially completed a questionnaire giving details of their demographic and personal characteristics and driving and cycling experience. Following viewing of each video clip, participants were then asked to complete a questionnaire with a series of

open-ended questions that sought to draw out the immediate emotional response of each participant.

Responses to four questions in particular then formed the focus of subsequent analysis:

- describe what happened in the clip:

This was scored with respect to three elements:

- positive/neutral/negative comments about the driver;
- positive/neutral/negative comments about the cyclist; and
- positive neutral/negative comments about the situation.

- who was at fault?

This was scored as to whether blame was attached to:

- the driver;
- the cyclist;
- the situation; or
- some combination of these.

- what might have caused the driver to behave the way they did?

This was scored in terms of attribution to:

- internal motive;
- cyclist behaviour; or
- other external influences.

- what might have caused the cyclist to behave the way they did?

This was scored in terms of attribution to:

- internal motive;
- driver behaviour; or
- other external influences.

### 4.2.2 Results

Participants' answers were examined clip by clip and question by question for significant associations between condition and response pattern, especially those in line with the anticipated effects of intervention. The outcomes of these analyses are presented below.

#### *Variation in response across clips*

The first point to note is that, irrespective of experimental condition, there was striking variation across the clips in participants' perception of the drivers, cyclists and situations involved in each case, and which of these was seen as being at fault. There were no reportable trends in the blame attribution or the positive/neutral/negative comments made regarding the driver, cyclist or situation.

There was also some tendency for comments about the causes of driver and cyclist behaviour to follow a related pattern. Participants typically made more *internal* attributions where blame was attached, in line with more widespread tendencies in western cultures to hold people personally responsible for their negative behaviour (see Miller, 1984). Thus, for a video clip where the driver had been seen as being more at fault, there was a correspondingly greater attribution to internal motivation and lesser attribution to external influences.

It should be noted that this otherwise largely consistent pattern of variation occurred despite the fact that it was not necessarily *objectively* the case that the scenarios differed in the degree of blame attributable to the various parties.

#### *Effect of experimental condition*

Given the strong shifts in response pattern across clips, detailed above, the question is whether either of the intervention conditions managed to produce any detectable variation in the perceptions of the participants. This issue can be addressed in two ways:

- by considering if there is any evidence whether the interventions *positively* shifted perceptions in favour of the cyclist; and
- by examining whether those in the intervention condition *lacked* specific biases in favour of drivers and/or against cyclists that were apparent in the control condition.

With regard to evidence of positive shifts in favour of the cyclist, there are a number of consistent signs that the 'Empathetic Intervention' in particular produced such effects, albeit primarily only in connection with Clip One (vehicle overtaking cyclist on narrow lane next to roadworks). For example, descriptions of what happened in Clip One by participants in the control group tended to evenly distribute negative comments between the driver, the cyclist and the situation. Participants within the 'Emphatic Intervention' group though tended to speak negatively about the driver and the situation more often, and about the cyclist less often. Similar trends are also observable through the other questions about blame attribution and reasons for driver and cyclist behaviour, for Clip One.

Thus for Clip One, there was a general trend towards those participants who experienced the 'Empathetic Intervention' especially showing enhanced awareness of the cyclist's perspective in their responses. It should be noted that this was the only one of the four video clips where there was no very obvious violation by the driver or the cyclist, but yet the incident still appears uncomfortable. Since it was also the only clip for which the 'Emphatic Intervention' produced some effect on responses, the implication is that some equivocality of this kind may be required within the situation for interventions to achieve any clear impacts.

There were a few instances of the 'Empathetic Intervention' provoking sensitivity to the cyclist's perspective in response to some of the other video clips but these were isolated and no conclusive trends may be drawn from them. There was no corresponding effect apparent from the 'Intellectual Intervention', for any of the video clips.

With regard to evidence of particular biases in favour of drivers and/or cyclists operating in the 'Control Condition', but being absent in the intervention conditions, there were some tentative signs of such effects, though only with respect to Clip Two and Clip Four. Participants within the 'Control Condition' were significantly more likely to describe the situation neutrally, whereas participants within the 'Emphatic Intervention' and the 'Intellectual Intervention' were more likely not to mention the situation at all. Bearing in mind that these were the video clips where

the driver was typically seen as being at fault, this might be seen as reflecting attempts by those in the 'Control Condition' to imply that the situation was pertinent, and so partially absolve the driver from responsibility.

#### *Effects of driver type*

Notwithstanding the effects of the interventions detailed above, there were also signs of drivers displaying biases against cyclists which were perhaps more resistant to change, in that they were still evident over and above the other trends. These effects were apparent in analyses that took driver type (i.e. whether participants drove for a living) as the dimension of comparison. These analyses revealed driver type to have a significant influence on the participant's description of the video clip situation. These influences were found to be consistent with earlier findings from this research, suggesting that professional drivers may hold stronger pro-driver and anti-cyclist biases than non-professional drivers may. For example, when viewing and then describing Clip One (vehicle overtaking cyclist on narrow lane next to roadworks) 26% of professional drivers made negative comments about the driver compared to 46% of non-professional drivers.

The trends, or any other corresponding effects, that are visible through the participants' descriptions of the video clips, are not visible throughout responses regarding blame attribution and reasons for driver and cyclist behaviour. Given the less spontaneous nature of these questions, and so a greater potential for management of responses in line with apparent expectation, it is possible that the sub-sample of professional drivers was too small for effects to stand out beyond the general pattern.

#### *Attitudinal responses in the initial questionnaire*

It will be remembered that all participants completed an initial questionnaire addressing their driving experience and attitudes, prior to receiving instructions relevant to their experimental condition and viewing the four video clips. Analysis of responses to the attitudinal elements of this questionnaire revealed no significant effects of condition, confirming that the 'Control Condition', the 'Emphatic Intervention' and the 'Intellectual Intervention' participants started on an equal footing in this respect. These analyses also found no significant effects of driver type, despite the biases exhibited by professional drivers in their spontaneous descriptions of the video clips, as outlined above. This tends to suggest that such biases arise in perceptions of specific situations rather than manifesting as *general* attitudes, consistent with the line taken by the 'Theory of Planned Behavior' framework (Ajzen and Madden, 1986), and with the findings of the 'Qualitative Research' and 'Quantitative Research' phases of this study.

As far as these more general attitudes were concerned, the pattern of responses also tended to confirm earlier research findings in another respect; i.e. that overall, attitudes to cyclists were not notably negative – but also that the presence of cyclists was not seen as especially salient either.

For instance, one question within the questionnaire required participants to rank order eight situations in terms of how stressful they found them. In total, 62 individuals answered this question as instructed (16 failed to do so), and the responses they gave showed systematic variation in rankings, but also some tendency to treat events involving other drivers as more significant than those involving other types of road user, including cyclists (see Table 3). In general, reported stress levels seemed to reflect primarily the potential for immediate damage to *self*, and as noted through the ‘Qualitative Research’ (Phase One), neither cyclists nor pedestrians loom very large to drivers in this respect.

A similar pattern is evident in responses to another question where participants were asked to rank situations in terms of the discourtesy shown to other road users. Again, responses from the 64 individuals who answered this question as instructed revealed systematic discrimination between these different situations. This time there was only a marginal overall bias towards other drivers (see Table 4), but this reflected the interestingly high ranking of discourtesy accorded to driving through a zebra crossing with pedestrians waiting. Infringements relating to cyclists were ranked sixth and eighth most discourteous, suggesting that cyclists as a group were not given much thought.

At the same time, when it came to questions addressing *negative* attitudes to cyclists, there was much less sign of any anti-cyclist sentiment. Responses to other questions which requested participants to rate how far they agreed with various tendentious statements concerning drivers and other road users, again showed systematic variation, but no especial bias towards drivers (see Table 5). In fact, with the midpoint on the nine-point rating scale being five, on balance all statements tended to be disagreed with, including both of those that expressed reactions against cyclists. Indeed, the contention that cycle facilities should not be provided if they caused delays provoked the second most extreme level of disagreement.

One further point to note here is that the statement which came closest to shading into agreement on average was that regarding drivers who delay others being the most annoying. This provides some support for the argument advanced elsewhere in this report that drivers feel themselves under pressure not to hold others up from a ‘social norm’ of keeping traffic moving. At the same time, however, it must be acknowledged that the data on this point are not entirely consistent, since ‘holding up other drivers’ was ranked the least stressful ‘other driver’ situation. Similarly, ‘driving slowly’ was not ranked as especially discourteous. It is possible, though, that the format of these questions (i.e. competitively ranking different situations),

**Table 3 Mean ranking of stress caused by eight situations (lower = more stressful)**

<i>Other driver situations</i>				<i>Other road user situations</i>			
<i>Holding up other driver</i>	<i>Signalling wrongly</i>	<i>Being flashed</i>	<i>Stalling at lights</i>	<i>Left turn, cyclist inside</i>	<i>Caught on pedestrian crossing when signals change</i>	<i>Stuck behind cyclist</i>	<i>Passed by motorbike suddenly</i>
4.79	3.87	2.61	3.95	5.40	6.04	5.14	4.24
Mean = 3.81				Mean = 5.21			

**Table 4 Mean ranking of discourtesy shown in eight situations (lower = more discourteous)**

<i>Other driver situations</i>				<i>Other road user situations</i>			
<i>Driving slowly</i>	<i>Turning off/on roundabout w/o signalling</i>	<i>Blocking bus lane</i>	<i>Blocking box junction</i>	<i>Crossing zebra with pedestrian waiting</i>	<i>Driving into cycle advanced stop line</i>	<i>Parking in cycle lane</i>	<i>Parking on double yellow lines</i>
5.02	4.06	5.11	3.33	2.81	5.69	4.86	5.11
Mean = 4.38				Mean = 4.62			

**Table 5 Mean agreement (scale from one to nine) with six statements (lower = greater disagreement)**

<i>Breaking speed limit is okay</i>	<i>Delaying others is the most annoying</i>	<i>No cycle facilities should be provided if cause delay</i>	<i>Good drivers can handle speed</i>	<i>Shouldn't have to expect children playing in the road</i>	<i>Cyclists should be on pavements</i>
3.92	4.57	3.66	2.81	3.93	4.18



combined with the use of more extreme instances of poor driver behaviour, may have led to the strength of drivers' feelings on this point being underestimated.

#### 4.2.3 'Video Intervention' conclusions

It must be acknowledged that, in comparison to the 'Virtual Reality Testing', the 'Video Intervention' produced less clear-cut results on the whole. This is unsurprising, however, bearing in mind the modest scale of the interventions that were used (i.e. simply asking participants to imagine themselves in the position of a cyclist whilst viewing four brief videos clips, or else to read a leaflet on cyclists' needs before doing so). There was, moreover, considerable – and unanticipated – background variation in the perception of the different scenarios, which overlaid and therefore probably obscured the potential effects of the interventions to some extent. The fact that, in spite of all this, both interventions did still manage to bring about a number of clearly identifiable instances of heightened sensitivity to cyclists' perspectives, consistent with prediction, is suggestive of robust effects that could be built upon in more prolonged and/or intensive interventions. This is actually as much as was hoped for at the outset, since, rather than conducting an extensive trial at this stage, the intention was to check for signs of the interventions having effects in the right direction, indicating avenues worth exploring more fully.

The study also yielded clear signs as to which of the two intervention methods it is worth pursuing further. Whilst the 'Intellectual Intervention', reading the 'Drive Safe, Cycle Safe' leaflet, did raise awareness of and identification with the cyclist's perspective in a number of instances, the effects appeared to be sporadic, probably because they were weaker. In contrast, the 'Emphatic Intervention', asking individuals to imagine they were the cyclist, produced effects which were notably more systematic, across responses to Clip One (vehicle overtaking cyclist on narrow lane next to roadworks) at least.

Although the effects of the 'Emphatic Intervention' were largely restricted to one particular scenario, this does not necessarily imply a weakness in the intervention technique. This restricted effect can be seen as reflecting the processes described in the conceptual framework, adding to our understanding of these, and signalling both constraints and opportunities that should be taken into account in any extended implementation.

As a final note, it is important to emphasise that the interventions examined here deal with the *interpretative* reactions of drivers, not their behavioural reactions, although the latter may be affected indirectly over time by changes in interpretation. The point is raised because it signals the need to consider some linkage at the policy level between infrastructure interventions and attempts to modify perceptions. The results of the simulation study suggest that infrastructural changes could be used to increase both the perceived and actual behavioural control of drivers, by reducing the degree of conflict they experience when encountering cyclists. This would enable behavioural reactions to be addressed directly, in a way that projective interventions could not achieve. However,

there is a potential danger that engineering measures on their own might serve to reduce further the consideration drivers give to cyclists by rendering them even less salient. If such changes were coupled with an empathic intervention of the kind evaluated here, however, this might act to reduce this danger. The benefits of coupling of this kind would, moreover, be likely to extend in the opposite direction. This is because changes to infrastructure to reduce perceived conflict would tend to increase further the incidence of the types of more equivocal situation within which it appears perceptions are most readily shifted, and awareness of the constraints on cyclists can be raised. Put simply, then, there is a need for both kinds of intervention because their direct effects feed into and reinforce each other.

#### 4.3 Findings from the 'Testing of the Research' phase

In drawing conclusions based upon the results of the experiments described, consideration must be given to two limitations of the experiments:

- the artificial nature of the environment experienced by the drivers in the experiment requires that caution must be exercised in directly relating their experimental behaviour to their likely behaviour in reality. However, it is held that there are good reasons for believing that the behaviours measured are broadly indicative, but the absolute measurements, for example of variations in speed or of the number of braking occasions, are not intended to be accurate representations of real behaviour.
- the limited number of subjects (forty) participating in the experiments has meant that it is not possible to disaggregate responses by driver type, age, experience or gender with any statistical reliability. Therefore while the sample was deliberately balanced, the results may mask variations in response among, for example, commercial as opposed to domestic drivers.

Despite these caveats, a number of interesting conclusions emerge from the testing of the research:

- the drivers' view of cyclists as an 'out group' is supported and reinforced through the results of this experiment;
- the effects of variations in infrastructure on driver attitude and behaviour are measurable regardless of the way cyclists actually behave;
- drivers tend to blame cyclists for the difficulties they experience when encountering cyclists at certain types of infrastructure;
- the provision of cycle lanes increases drivers' confidence and perceived ease of passing in any given situation, regardless of whether the lane is actually used by the cyclist;
- although the addition of a cycle lane mitigated the negative effects of the road narrowing on drivers' subjective responses, it did not return their level of confidence, or their assessment of the cyclist's consideration, to the levels reported when encountering the cyclist on a normal road;



- cyclists who are perceived as being deliberately obstructive are likely to attract more hostility than those who are considered merely incompetent. This may reflect the importance that drivers themselves accord to not delaying other road users;
- when forced into proximity to cyclists by the road layout, driver behaviour becomes more variable than in other situations. This suggests that drivers may lack well-defined strategies for coping with this situation; and
- drivers tend to consider their own behaviour to be highly considerate, regardless of circumstances.

#### 4.4 Findings in relation to social psychological theory

Through all twelve of the Worlds, drivers' ratings of their own consideration were uniformly high – from 1.5 to 2 times as high as their ratings of the cyclist's consideration. This pattern of highly positive self-perception, largely insulated from events themselves, is a well-established characteristic of those who see themselves as members of dominant groups (Tajfel and Turner, 1986). Thus there is some evidence for drivers seeing themselves as an 'in group', with a strong sense of their own competence, as anticipated by the conceptual framework.

Conversely, the consistently lower ratings of consideration shown by the cyclists are as would be expected if drivers perceived them to be an 'out group'. The same is true of the way these ratings vary as a function of road features such as refuges (i.e. things that are not realistically the cyclist's fault); despite the cyclist's behaviour actually remaining the same across the refuge and non-refuge trials. Both of these responses are characteristic of the unreasonable attribution of 'out group' behaviour to internal disposition, especially at points of conflict. Also consistent with this picture is the fact that whilst refuges served to dent drivers' self-esteem (as shown by the drop in ratings of driver consideration) their impact on rating of the cyclist's consideration was much greater, revealing substantial imbalances in the allocation of blame, of the kind predicted. All in all, then, there are sufficient signs of both 'in group' and 'out group' processes of the type anticipated to be taken as at least tacit support for this strand of the conceptual framework.

With regard to the pressures on drivers to act cautiously, and the hypothesised influence of the cyclist's perceived predictability, the data are substantially more clear-cut, and more or less unequivocal in their support for the proposed framework. First of all, the perceived pressure towards caution is apparent in drivers' lower ratings for ease of passing and for their own consideration when a cycle lane was absent on an otherwise clear road than when it was present, although the cyclist's speed and braking behaviour was actually no different. In other words, when there was less in the way of road features to define where the cyclist might be expected to be relative to the road, drivers felt significantly less comfortable. It is also noteworthy that even under the 'ideal' conditions of a cycle lane on a clear road with the cyclist staying within it, driver confidence that they knew what the cyclist was going to do was not more than moderately high.

When refuges were introduced and drivers were forced into greater proximity with the cyclist, they perceived the cyclist's behaviour to be significantly less predictable (although it was in fact no different across these trials to those where refuges were absent). They also rated the cyclist as significantly harder to pass and, crucially, drove more slowly and hesitantly under these conditions, confirming that reductions in cyclist predictability do feed through to reduced behavioural control and possibly more risk.

A more subtle correspondence to the conceptual framework is apparent in the fact that the physical constraints imposed by the road had a completely separate influence, on perceived predictability and its consequences, to that of the cyclist's behaviour, i.e. they were additive, not interacting influences. As anticipated, then, these are distinct sets of factors, although they have common outcomes.

At this stage, it is acknowledged that the simulation trials, for reasons of practicality, did not explore the effect of the presence or absence of other drivers and the social pressure they create. Therefore, with regard to the 'Theory of Planned Behavior' it is not possible to use the results of this 'Testing of the Research' phase to further any more understandings and links to the 'social norm' element of the conceptual framework.

## 5 Conclusions and Recommendations

This project was commissioned following previous research for DfT that investigated attitudes to cycle use. A key finding of that work was that some cycle users reported significant conflict with motor vehicle users and some believed that motorists' approach to cycle users was one of hostility or even active aggression. A primary objective of this research has been to investigate the accuracy of that impression.

In relation to that assertion, this research has not identified any evidence of aggression towards cyclists among any significant number of drivers. This research has, however, indicated that there do appear to be points of stress in the relationships between motor vehicle and cycle users and that the interplay between a number of factors is responsible for influencing the behaviour of drivers towards cyclists.

Rather than active hostility, the early stages of this research revealed that motorists do not have particularly strong feelings towards cyclists at all. While for cyclists encounters with motor vehicles are frequent and potentially injurious or lethal, for drivers encounters with cyclists are a rarer experience and are not at the forefront of drivers' minds. Motor vehicle users seem to reserve their active concern for other motor vehicle users, primarily those of other vehicle classes, with the capacity to cause them annoyance or injury, for example taxis and goods vehicles.

When prompted to consider cyclists in detail however it is clear that motorists hold negative views about cyclists and tend to view cycle users as an 'out group' with significantly different characteristics from most road users. Key among

these characteristics is vulnerability, which perhaps contributes to driver stress when cyclists are encountered, and a perceived unpredictability as road users.

The unpredictability of cycle users is seen to be a particular source of irritation to drivers when it compromises drivers' own convenience. Further, drivers' estimation of cyclists' unpredictability is partly related to other sources of negative attitude and cyclists' status as an 'out group' leading to drivers to interpret their behaviour as dispositional and therefore not to be predicted by reference to situational factors. Drivers' estimation of the unpredictability of cyclists in particular seems to be significant in influencing driver behaviour, resulting from its apparent negative impact on drivers' perceived behavioural control: their perceived ability to successfully behave in the way that they know to be ideal.

Drivers recognise that some cyclists are more unpredictable than others and state that they are prepared to take additional care when encountering cycle users that appear inexperienced or risk-taking. Nevertheless, as might be expected in line with 'Social Identity Theory', the 'out group' status of cyclists brings with it a tendency among drivers to impute the poor or incompetent behaviour of some cyclists to all cyclists. Thus, despite degrees of unpredictability, cyclists en masse are seen as less reliable than motorised road users. Moreover, this unpredictability seems to be considered inherent, i.e. 'dispositional', not a consequence of the influence of external environmental factors on the cycle user.

When encountering a cycle user in circumstances that require care, most drivers appear to recognise that ideally they should give consideration to the cyclist, slowing down if necessary and waiting until it is safe to pass the cyclist or until sufficient space is available to give the cyclist adequate clearance. The response of drivers to questioning about the 'average' driver's response however indicates that the 'social norm' (within the 'Theory of Planned Behavior') may be generally considered to pass cyclists even where it is recognised not to be ideal behaviour. Further, the individual driver's perceived behavioural control in fulfilling their stated desire to behave cautiously is further undermined by what they consider to be a strong obligation to other motorised road users (fellow members of the 'in group') not to delay them. This sense of obligation seems to contribute to recognition that, despite understanding the ideal behaviour when encountering a cyclist, many drivers consider that the majority response would actually be to attempt to pass the cyclist.

This research has also revealed evidence that the response of drivers encountering cyclists is also influenced by the context of the encounter. This is significant in two respects:

Firstly, the apparent lack of understanding of how to use certain types of infrastructure specific to cyclists, notably the difference between mandatory and advisory cycle lanes and the purpose and correct use of cycle advanced stop lines, seems to influence driver behaviour. The lack of a pre-defined strategy for drivers to refer to when encountering cyclists at these highway features seems to lead to a diversity of improvised responses which may be unsettling or alarming to cycle users.

Secondly, the effect of infrastructure that clearly defines ownership of space, in the case of these experiments the provision of cycle lanes in the virtual reality worlds, appears to increase driver confidence and, hence, potentially risky behaviour, such as higher vehicle speeds and less speed reduction when encountering cyclists. These effects were observed even where the cyclist encountered was not actually using the space provided for them.

Finally it should be noted that context appears to affect the relationship between drivers and cycle users. When drivers encounter cyclists in circumstances that cause them to slow or deviate, in the case of this research a central refuge, their estimation of the cyclist's discourtesy increases, regardless of the cyclist's actual behaviour. Highway features that increase conflict between cycle users and motorists may damage relations between drivers and cyclists, although it is not known what the behavioural consequences or long term effects of this may be.

This research concluded with some initial investigation of the effectiveness of different approaches to challenging drivers' tendency to view cyclists' behaviour as unpredictable and unrelated to external environmental factors. This investigation only recorded weak effects, however empathetic intervention was slightly more effective than intellectual intervention. This element of the research also revealed that drivers' responses vary with the scenario presented to them, even if the scenarios appear objectively similar.

On the basis of this research, a number of recommendations may be made:

#### *Highway design*

- The study finding that drivers tend to blame cyclists for the difficulties they experience when encountering road narrowing suggests that certain highway features may increase tensions between the two types of user. Where there are significant speed differences between drivers and cyclists, physical measures that force them into close proximity should be avoided or motor vehicle speeds should be reduced, particularly on routes where there are high flows of cyclists or which offer strategic routes for cyclists. Where such features are considered unavoidable, adequate space should be allowed for cyclists and vehicles to use them without undue stress. All new features on the highway should be subject to a cycle audit particularly those that would increase the proximity of cyclists to motorised vehicles.
- Measures that deliberately require cyclists to obstruct traffic in order to produce a traffic calming effect should be avoided. The strategies adopted by some cyclists to deliberately hold up drivers until the cyclist believes it is safe for them to pass are likely to provoke particular hostility. Designs that require such behaviour are likely to cause particular frustration to drivers.
- Where cycle facilities are provided they should clearly meet the needs of the design user and be of sufficiently high quality to enable use. This study has found that the presence of a cycle lane increases driver confidence regardless of whether the lane is actually used by

cyclists. Arguably the effect of providing facilities that increase drivers' confidence but are unsuitable for cyclists to actually use may increase cyclists' exposure to risk. This implies that those responsible for the provision of cycle infrastructure should ensure that the recommended standards set out in manuals such as the Cycle-Friendly Infrastructure Guidelines (IHT, CTC, DoT, The Bicycle Association, 1996) are adhered to as closely as possible.

#### Awareness raising

- Education of drivers should focus not on helping them to predict cyclist behaviour but on understanding that circumstances will influence that behaviour. This would require an acknowledgement on the part of the driver that the surrounding environment affects cyclist behaviour and challenge one of the central elements of cyclists' status as an 'out group'.
- Drivers' education, including the Highway Code, should include advice on how to respond when encountering cyclists at certain types of road feature, both those explicitly providing for cyclists and other highway features. More clearly defining the appropriate responses may assist drivers in knowing how to behave more considerately and in resisting social pressure from other drivers to force their way past cyclists.
- Programmes of training to improve cyclist skills and behaviour may be helpful.

#### Enforcement

- The current low level of enforcement of traffic law with regard to both drivers and cyclists should be increased.

#### Research

- Further research into the behavioural response of drivers to frustrating conditions, including encounters with cyclists, should be conducted in order to establish whether the frustration experienced by drivers is expressed as negative behaviour.
- Some regional variations in attitude to cyclists were identified in the early stages of this research. Further research to investigate in more detail the basis of this variation may be useful in identifying practices likely to promote a better relationship between cycle users and motorists.

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## Appendix A: Relevant psychological frameworks and methodologies

The following theoretical framework review has been used to guide the research. It is based on a model that has been developed in the US, called the 'Theory of Planned Behavior'. This section of the report sets out in some detail the applicability of the model to this study.

The 'Theory of Planned Behavior', Ajzen and Madden's (1986) extension of the earlier 'Theory of Reasoned Action' (Fishbein and Ajzen, 1975) can be seen as an attempt to devise a coherent framework within which to examine the relationship between the attitude and behaviour. That such a framework was needed, and that it would not be of a straightforward nature, had been signalled by some sixty years of social psychological research which had failed to find anything other than weak correlation between measured attitudes and behaviour, despite the intuitive plausibility of the connection.

Fishbein and Ajzen (1975) made two suggestions as to why such results had been obtained. First of all, they pointed out that researchers had typically measured *general* attitudes (e.g. towards religion) and looked for effects on *specific* behaviours (e.g. church attendance). As a consequence of this mismatch in levels of measurement, it was likely that any association would be obscured by substantial amounts of 'noise' in the data. One solution (the one they focussed on themselves) was to concentrate on examining specific attitudes towards performing specific behaviours, since logically, if attitude had any bearing on behaviour, this was the level at which it would operate.

Their second suggestion was that the attitude-behaviour relationship was in any case not a direct or simple one, but rather that it was mediated by other influences. Thus they proposed that attitudes affected not behaviour itself, but people's judgements when they were formulating the intention to perform a certain behaviour. In essence, what would happen was that people would envisage the potential outcomes of the behaviour, assess the likelihood of those outcomes, and the value associated with them, and then come to some overall positive or negative judgement about performing the behaviour, based on the overall judgement of a high probability of high value outcome. For example, the thought of winning the raffle at a church bazaar would not have a major bearing on whether you bought a ticket, whereas winning £1million or more is typically the prime consideration in buying a lottery ticket.

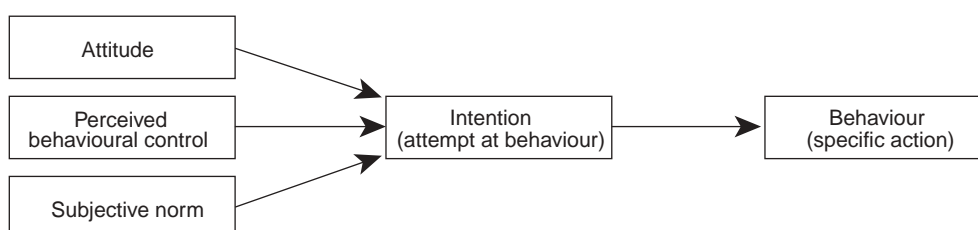
Moreover, attitudes were just one factor affecting the intention to perform a behaviour. Intentions would also, Fishbein and Ajzen argued, be influenced by what they

termed the *subjective norm* i.e. an assessment of the perceived attitudes of *other* people towards the behaviour in question, and the extent to which the individual was motivated to comply with these others. For example, the opinion of one's next door neighbour might not count for much, but that of one's partner or friends might. It would often be the case that attitude and subjective norm would be consonant and would therefore reinforce each other in the formulation of behavioural intentions. However, under many circumstances they might be opposing, and individuals would have to decide which was the stronger consideration. There is good evidence in fact that the subjective norm is frequently the over-riding influence (see e.g. Parker, Manstead, Stradling, Reason and Baxter, 1992, with regard to influences on driving violations; and the impact on drinking and driving of perceived shifts in what is socially acceptable).

This framework, known as the 'Theory of Reasoned Action', generated much research over a decade or so, but it became apparent during this time that it suffered from an important limitation. It was specifically to deal with this limitation that Ajzen and Madden (1986) produced a modified version, the 'Theory of Planned Behavior', which included *perceived behavioural control* as an influence on intentions. The point at issue here was that whilst attitude and subjective norm could reasonably be described as influencing intentions, intentions were less clearly related to behaviours since many external factors might intervene to thwart them. However, to the extent that these external factors could be foreseen, their impact would be taken into consideration. Thus if the perceived degree of control an individual had over performing a behaviour was sufficiently small, it would prevent them translating a desire to perform that behaviour (as determined by attitude and subjective norm) into an *intention*. For instance, you might have a strong desire to climb Mount Everest, but recognise that your physical state was such that you would never be able to achieve it, and so not bother to make the attempt. Once the potentially powerful nature of this influence on intentions had become clear, it was evident that the theoretical framework had to be expanded to encompass it.

### Framework of the 'Theory of Planned Behavior'

The overall framework provided by the 'Theory of Planned Behavior' is as follows, then:



Since the mid-1980s this framework has been used extensively both in Europe and the US to steer research on the relationship between attitudes and behaviour in a wide variety of areas, and in particular with regard to health issues (e.g. mother's decisions on breast feeding, use of condoms etc.). More pertinently for present purposes, it has also been explicitly used to address aspects of driver behaviour. Although to our knowledge the 'Theory of Planned Behavior' has not to date been used to examine how drivers behave towards cyclists, there is nevertheless a coherent body of work relating it to other elements of driving. This research has served to establish the importance of the factors identified by the theory, and strongly suggests that it is also likely to be applicable to the current context.

Work relating driver behaviour to social factors has had a relatively long history, but until comparatively recently it had focussed on the influence of attitudes. One of the first studies which hinted at the relevance of the additional parameters considered by the 'Theory of Planned Behavior' was that conducted by Baxter, Manstead, Stradling, Campbell, Reason and Parker (1990). This research examined the influence on driver behaviour of the presence of a passenger, via a series of covert observations. The main findings were that the incidence of both signalling and speeding appeared to be reduced by the presence of certain types of passenger, in particular older females. The implication was that drivers' specific actions could be influenced by their consideration of the likely attitudes towards those actions of important others, especially if their awareness of those others' attitudes was heightened by their physical presence. In other words, then, it pointed to the relevance of the subjective norm component of the 'Theory of Planned Behavior'.

Subsequent work by Parker, Manstead, Stradling, Reason and Baxter (1992) confirmed that this was the case, but also illustrated that the third component of the theory, perceived behavioural control, was a major influence on driver behaviour too. This study was the first to explicitly apply the 'Theory of Planned Behavior' to aberrant driving behaviour. It assessed the ability of the theory to account for drivers' intentions to commit four specific driving violations, whether in the presence or absence of a passenger: drinking and driving, speeding, close following, and overtaking in risky circumstances. A stratified sample of drivers was surveyed with a questionnaire designed to measure all the key constructs in the theory:

- attitudes towards the behaviours;
- subjective norms;
- perceived behavioural control (argued to be an important determinant of intention when drivers have previous knowledge or experience of the behaviour in question); and
- actual behavioural intentions.

Results showed that the addition of perceived behavioural control to the measures led to significant increase in the amount of explained variance in intentions, thereby supporting the general framework provided by the theory. In particular, the easier drivers perceived it to be to

avoid the violation, the less they saw themselves as being likely to commit it. However, the strength of this relationship was variable, and was in general slightly weaker than the impact of subjective norms. Similarly, the relation between attitudes towards behaviours and behavioural intentions was consistently stronger than that between attitudes towards behaviours and behavioural intentions. In each scenario considered by the study, the greater the perceived disapproval of others, the less likely drivers felt they were to commit the violation. A further important finding was that it was possible to differentiate subgroups of drivers with regard to their normative beliefs and motivation to comply with these. In particular, younger drivers were less likely to see others as disapproving of violations, but were however more motivated to comply with perceived norms.

Overall, the implication of the research was that drivers felt violations were more likely under circumstances where their control was impaired, and where other people were less disapproving. Attitude per se had little direct bearing on the likelihood of violations. It is important to note, though, that the effect of perceived control was always moderated by disapproval of others, suggesting that where drivers see disapproval for violations as being high, they take more care to exert what control they can. This would appear likely to be particularly true for younger drivers. These points have clear implications for driver behaviour towards cyclists, where both control and perceived disapproval may be low. There were nevertheless some circumstances considered by the research (notably 'close following') where control was seen as less of an issue, indicating that blanket statements about the impact of these factors are probably inappropriate, and that assessment on a behaviour-by-behaviour basis is necessary.

Subsequent work, summarised by Stradling and Parker (1996), extended the application of the Theory of Planned Behavior to driver behaviour, and in addition proposed a framework which identified systematic differences in the nature of problematic driver actions and corresponding variations in the impact of the different components of the theory. In particular, drivers were characterised as passing through three phases as they become increasingly competent at handling a vehicle on the road: the technical mastery phase, the reading the road phase and the expressive phase. Novice drivers, who are in either the first or second phase, were considered to have specific problems of their own which merited separate attention, since the more social influences dealt with by the Theory of Planned Behavior would be less relevant. Work therefore concentrated on the third phase, which covers the vast majority of drivers. Survey studies (including Reason, Manstead, Stradling, Baxter and Campbell, 1990; Parker, Reason, Manstead and Stradling, 1995; Parker, West, Stradling and Manstead, 1995) found that the problematic behaviours exhibited by drivers in this phase grouped into three types:

- lapses (mistakes due to divided attention or lack of engagement in and by the act of driving);
- errors (mistakes due to failures of observation and misjudgement); and
- violations (deliberate deviations from safe practices).

Violations were identified by this research as being of particular concern, since drivers who committed violations (more typically those who were male and/or young) were significantly more likely to be involved in accidents. Violations were also identified as being especially appropriate for consideration within the framework provided by the Theory of Planned Behavior since they resulted from intentional behaviour. Further work therefore applied the theory to a variety of specific violations beyond those dealt with by Parker *et al.* (1992), including cutting across lanes to leave the motorway, weaving in and out of lanes, overtaking on the inside, flashing headlights at the vehicle in front to go faster, accelerating through traffic lights as they turn red, and speeding in different limit zones. This research found considerable variation across violations in the relevance of different predictors, underlining the importance of looking at problematic behaviours instance by instance. So, for example, Parker, Manstead and Stradling (1995) found that attitude, subjective norm and perceived behavioural control were all related to cutting across lanes, but subjective norm was less relevant to weaving in and out of lanes, and both attitude and perceived behavioural control were less relevant to overtaking on the inside. Similarly, whilst attitude was relevant to speeding of all types, subjective norm was relevant to none, and perceived behavioural control was only relevant to doing 70 in a 60 mph zone.

Two further points emerged from this more recent research. The first is that whilst in general the three components of the Theory of Planned Behavior permitted reasonable levels of prediction of the intention to commit driving violations, the strength of prediction was increased when additional parameters to those considered by the theory were taken into account, pointing in particular to the relevance of what might be termed individual difference variables. For instance, Parker, Manstead and Stradling (1995) found that the addition of measures of anticipated regret and moral norm substantially improved prediction of intentions to cut across lanes, weave in and out of lanes and overtake on the inside. This suggested that personal normative influence was also an important factor in shaping intentions to perform behaviours that are antisocial or socially controversial. Lawton, Parker, Stradling and Manstead (1997), taking a more general approach to individual difference variables, presented data pointing in a similar direction. Earlier research had reported a relationship between mild social deviance and accident rates, but indicated that this was partly mediated by faster driving speed. The aim of this research was to determine whether driving violations more generally mediated the relationship between mild social deviance and accident rates. Self-reports of violations, mild social deviance and accident rates were collected for a large sample of drivers, together with information about age, sex and annual mileage. Analysis of this data confirmed the relationship between mild social deviance and accident rates, but also found that this relationship appeared to be mediated by the propensity to commit driving violations. In other words, then, a general tendency towards social

deviance (particularly as regards the expression of irritability) appeared to be associated with the commission of driving violations, above and beyond the influence of specific attitudes or perceptions of subjective norms and behavioural control.

The second point concerns the nature of the relationship to problematic driving behaviours of perceived behavioural control. Whilst perceived behavioural control has been found to have an influence on violations, this influence, as noted above, is variable and frequently not a strong one. Moreover, the direction of influence is towards greater perceived control leading to a reduced likelihood to commit violations. Since the corollary of this is that lower perceived control is more likely to be associated with problematic behaviour, the implication is that this parameter may in fact be more relevant to errors than to violations, especially amongst less experienced or more stressed drivers, although there is to date less in the way of hard data to back this up. Certainly, Lawton and Parker (1998), reviewing the literature on accidents at work rather than on the road, conclude that research into individual differences in accident liability should consider two possible routes to accident involvement via errors and violations. They argue that errors are predominantly associated with cognitive factors (cf. perceived behavioural control), whereas violations have their origins in social psychological factors (cf. subjective norms and attitudes). They also contend that individuals differ in their reaction to stress, so that although some respond by an increase in risk-taking behaviour, the effect on others is to increase the likelihood of sub-optimal performance in terms of information processing.

At the same time, however, there is a further way in which perceived behavioural control might be related to problematic driving behaviours, through overestimates of control leading to attempts to perform unwise, risky or dangerous behaviours. Under these circumstances, the direction of influence would be towards greater perceived control leading to an increased likelihood to commit violations. This possibility has received little direct attention, but Reason *et al.* (1990) did find that drivers who admitted more violations considered themselves to be better drivers than did others. Evans and Norman (1998) provide a further pointer towards the same idea in work applying the Theory of Planned Behavior to the prediction of pedestrians' road crossing intentions. Respondents in this study completed questionnaires which included scenarios of three potentially dangerous road crossing behaviours, followed by measures of attitude, subjective norm, perceived behavioural control, self-identity and intention. The results indicated that the variables under consideration were able to explain a considerable proportion of the variance in intentions to cross the road in the manner depicted in the scenarios. However, the perceived behavioural control component emerged as the strongest predictor of pedestrians' intentions, and the relationship was positive. Thus those who considered themselves, perhaps unrealistically, to have greater control or skill were more likely to intend to attempt dangerous crossings. If this positive relationship between perceived

behavioural control and violations is in fact a real one, it suggests that the reason in part that previous driver behaviour research has uncovered weak or unstable associations between perceived behavioural control and violations is that conflicting positive and negative relationships for different groups of drivers have been confounded in statistical analyses. The implication is that in addition to examining the relationship between the Theory of Planned Behavior components and behavioural intentions instance by instance, it is also necessary to do so independently for different driver groups.

These points about the impact of perceived behavioural control are of particular importance for the present research because novices or people otherwise required to engage in an unfamiliar activity (which might include navigating round cyclists, given their relative rarity in the UK) are likely to have substantially less accurate perception of their behavioural control, tending to either over- or underestimate their ability, and in consequence to make poor behavioural decisions. Moreover, there are indications that assessments of attitudes and subjective norms are most influential in the case of deliberate and well thought through behaviours, and that as behaviours become more automatic (as much driver behaviour is) perceptions of behavioural control are increasingly decisive.

Given the weight of evidence in its favour, it is clear that any study of the relationship between driver attitudes and driver behaviour has to take into account the framework encompassed by the Theory of Planned Behavior. Equally, though, it must also bring into consideration all the parameters of that framework, and attempt to gain information on each. The specific implications for the conduct of the present research are as follows:

The research needs to focus on specific behaviours (e.g. overtaking, giving way etc), and both errors and violations in relation to these, since the influence of attitudes, subjective norms and perceived behavioural control may well be different in each case.

Drivers should be questioned as to their intentions and their actual behaviour in each instance, since the two may not correspond, and the degree of conscious intention may vary. Moreover, drivers from different subgroups should be interviewed, given that both intentions and actual behaviour are likely to vary across these.

An attempt should be made to uncover not just drivers' attitudes to the intended behaviour, but also: their perception of the attitudes of others (especially the other drivers around them at the time) i.e. the subjective norm; their perceived ability to execute the intended behaviour (perceived behavioural control); and the accuracy of that perception.

As regards possible methods of intervention, whilst direct attempts to change attitudes may be important, alternatives such as changing perceived norms and improving the accuracy of perceived behavioural abilities might also merit serious consideration. This is especially true in the light of an extensive literature illustrating that if behaviour can be changed by other means, attitudes will typically follow suit (see e.g. Petty, 1995, for a review).

#### *Other relevant research*

Carthy *et al.* (1993) undertook a major study for the AA Road Safety Foundation into perceptions and attitudes to risk and safety on the roads. They found that, 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 response 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. Drivers rated locations as being high risk when they involved competing or defensive manoeuvres or lacked clear information about who had priority. However, competing pedestrian activity did not affect their assessment of risk. It seems likely that drivers' perceptions of pedestrians and risk may be similar to those demonstrated towards cyclists.

Carthy *et al.* used the Theory of Planned Behavior as a framework for the study. They also developed a competition model of road user behaviour. This draws on animal behaviour studies and shows that drivers' decisions, justification, and risk ratings predominantly reflect their feeling of relative dominance. (This idea is explored by Ipos in the qualitative phase of this project.)

They conclude that the risks of using the roads are not fully appreciated by drivers. 'In particular, there is little sensitivity to the position of pedestrians, who do not seem to figure in drivers' assessments of risk.' They also conclude, 'In general, attitudes are as important to consider as engineering countermeasures.' They recommend countermeasures which 'operate unobtrusively' so as to reduce the likelihood of creating challenges for certain drivers which may be counterproductive. Translating this to improving safety for cyclists this would seem to imply cycle-friendly road design, such as wider lanes, rather than cycle facilities, such as cycle lanes which narrow the driving lane.



## Appendix B: The Virtual Reality equipment

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The Virtual Reality (VR) experiments were conducted using simple computer and projection equipment. The Worlds were generated and run on a PC and the visual information was projected onto a screen in front of the subject. The subject's view was as though through the windscreen of a car, as depicted in Plates B1, B2 and B3. In addition to the visual information, there was audible feedback via speakers with the computer generating engine noise that rose or fell in pitch in proportion to the speed of the vehicle.



**Plate B1** Straight ahead cyclist on left, normal road with no features



**Plate B2** Straight ahead cyclist on left, traffic island and advisory cycle lane



**Plate B3** Straight ahead cyclist in centre of lane, traffic island and advisory cycle lane

The physical interface with the equipment was a steering wheel and accelerator and brake pedals. There was no clutch as the virtual vehicle behaved as an automatic car. Each subject was instructed to operate the pedals only with their right foot.

Whilst driving, the subjects sat in a chair whose distance from the steering wheel and pedals could be adjusted by the subjects in order to make themselves comfortable and adopt a familiar driving position.



**Plate B4** The Virtual Reality equipment in use

## Abstract

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This report describes research that examined the attitude and behaviour of drivers towards cycle users. A range of qualitative and quantitative research techniques were used, including the use of virtual reality equipment to simulate encounters between drivers and cyclists. Variations in driver attitude and behaviour based on a number of factors, including physical infrastructure and cyclists behaviour were examined. The research also examined the effectiveness of two different approaches to improving drivers' consideration of the needs of cyclists. The report makes recommendations to improve driver training, for the layout of roads and for future campaigns to raise awareness of cyclists among drivers.

## Related publications

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- TRL369 *New cycle owners: expectations and experiences* by D G Davies and E Hartley. 1999 (price £25, code E)
- TRL365 *Achieving the aims of the national cycling strategy: summary of TRL research* by D G Davies, P Emmerson and G Gardner. 1998 (price £35, code H)
- TRL285 *Cyclists at roundabouts - the effects of 'continental' design on predicted safety and capacity* by D G Davies, M C Taylor, T J Ryley and M E Halliday. 1997 (price £35, code H)
- TRL266 *Attitudes to cycling: a qualitative study and conceptual framework* by D G Davies, M E Halliday, M Mayes and R L Pocock. 1997 (price £25, code E)
- TRL241 *Cyclists at road narrowings* by D G Davies, T J Ryley, S B Taylor and M E Halliday. 1997 (price £35, code I)
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