Department for Transport

In Depth Study of Motorcycle Accidents

Road Safety Research Report No. 54

November 2004

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1 EXECUTIVE SUMMARY

Motorcycle accidents have somewhat different characteristics to accidents involving other classes of road user. In particular, they include 'right of way' accidents, accidents involving loss of control on bends, and accidents caused by motorcyclists using the more frequent overtaking and passing opportunities that this choice of transport affords them. Increases in scooter and motorcycle sales in recent years have caused a corresponding increase in deaths and serious injuries caused to their riders, following a period of relative decline. Scooters have seen a 16% rise in sales between 2002–2003; and recent licensing data for larger motorcycles (above 500cc engine capacity) shows that they now account for around half of all registered motorcycles, so this pattern seems set to continue.

A sample of 1,790 accident cases was considered, including 1,003 in detail, from Midland police forces, involving motorcyclists of all ages, and covering the years 1997–2002 inclusive. Each case was summarised on a database including the main objective features (such as time and place) and a summary narrative, a sketch plan and a list of explanatory factors. The summary narrative, in particular, included judgements by the researchers that emphasised the sequence of events leading up to the accident. In addition, a 25 item questionnaire was completed by a sample of relatively experienced motorcyclists recruited through the Motorcycle Action Group (MAG).

Significant differences were discovered in the sample with respect to the types of accidents involving motorcyclists (and their blameworthiness). The main findings were as follows:

- There seems to be a particular problem surrounding other road users' perception of motorcycles, particularly at junctions. Such accidents often seem to involve older drivers with relatively high levels of driving experience who nonetheless seem to have problems detecting approaching motorcycles.
- Motorcyclists themselves seem to have far more problems with other types of accident, such as those on bends, and overtaking or 'filtering' accidents.
- There are two main groups of riders that interventions should be focussed on. The first is young and inexperienced riders of smaller capacity machines such as scooters, and the second is older, more experienced riders of higher capacity machines. Both the skills *and* attitudes of these riders need to be addressed.

2 INTRODUCTION

2.1 Motorcycle accidents

Motorcyclists have an especially poor safety record when compared to other road user groups. Their killed and serious injury (KSI) rate in the UK, per million vehicle kilometres, is approximately twice that of pedal cyclists and over 16 times that of car drivers and passengers. Motorcyclists make up less than 1% of vehicle traffic but their riders suffer 14% of total deaths and serious injuries on Britain's roads (DETR, 2000).

26,192 motorcyclists (this figure includes moped and scooter riders) and pillion passengers were injured in reported accidents in Great Britain in 1999. 6,361 of these injuries were considered serious, and 547 motorcyclists and passengers were killed. In the same year 205,735 car drivers and passengers were injured in accidents. 18,681 of these injuries were considered serious, and 1,687 drivers and passengers died.

In 1999 a motorcyclist was killed or seriously injured for every 665,894 kilometres ridden. Car drivers, however, covered an average of 18,661,626 kilometres before a serious injury or death occurred. According to these figures, in 1999 motorcyclists were approximately 28 times more likely to be killed or seriously injured on the roads in Great Britain than car drivers.

Chesham et al. (1993) compared distance travelled with injuries sustained and found that in 1990 a motorcyclist was 35 times more likely to be killed or seriously injured than a car driver. Although the figures have improved over the last 10 years, the risk factor for motorcyclists when compared to car drivers is still very high. It is important to remember that, compared in an accident, a motorcyclist is much more vulnerable to personal injury than a car driver. Safety and accident avoidance for motorcyclists is therefore of paramount importance.

A similar picture is given by research in other countries. Motorcycle riders in New Zealand accounted for approximately 20% of fatalities and 25% of hospitalisations for road traffic accidents as a whole, but motorcycles represented only 5% of licensed vehicles and accounted for only 1.4% of estimated total vehicle mileage in that country (Reeder et al., 1999). Young male riders, in particular, were identified as a problem; riders aged 15–24 years accounted for 67% of all motorcycle accident fatalities. This led to the introduction of a graduated licensing scheme in New Zealand, which has reportedly reduced casualties in the target group of 15–19 year olds by 22%, though this mainly occurred by reducing that groups' overall exposure to motorcycle riding.

Research in Norway by Kopjar (1999) investigated young riders' moped accidents, the use of mopeds in that country apparently being relatively widespread in the 16–17 year old age group. Kopjar discovered that moped-related accidents accounted for 50% of hospitalisations for traffic accidents as a whole, and that 43% of moped accidents were single vehicle incidents. He concluded that moped injuries were a serious problem in late adolescence, and that road safety professionals often overlooked the moped problem.

Though a fall in the amount of motorcycling and changes in motorcycle training in the UK both contributed to a fall in the number of motorcyclist casualties in the early 1980s and mid-1990s, this trend has reversed in more recent years. The possible reasons for this include the increasing sales of mopeds and scooters: the number of motorcycles, scooters and mopeds that are newly registered has more than doubled between 1991 and 2001, with over 177,000 being registered in 2001. This is despite an earlier fall in registrations to below 59,000 in 1993. Between 2001 and 2002, two-wheeled motor vehicle traffic rose more than other categories, with motorcycle traffic seeing a rise of 5.5% (DfT, 2003). There are also increasing numbers of older motorcyclists returning to the road on fairly powerful machines after a long break in riding motocycles; KSI casualties in age groups between 30 and 59 have increased in the last 10 years and, similarly, Ormston et al. (2003) found that, in Scotland, motorcyclists aged over 30 have accounted for an increasing proportion of casualties since 1997. According to the National Statistics/DfT (2003) National Travel Survey (NTS), average trip lengths have increased from 6.1 miles to 9.7 miles, while the average motorcycle rider now spends 3.2 hours a week riding a motorcycle compared with 3.0 hours between 1989 and 1991.

The reasons for riding tended not to vary between males and females, although the NTS found that men were nearly seven times more likely to make a motorcycle trip than women, and young male motorcyclists were the heaviest users in terms of both the average number of trips they made (10.0 per driver per week) and distance travelled (77 miles). Distance travelled increased with engine size. In the period 1992–2001, 43% of motorcycles in the NTS sample had engines over 500cc in capacity (16% below 50cc). Although smaller motorcycles were used mainly for commuting, business or education and less for leisure purposes than larger motorcycles (over 500cc), these too were also used mainly for commuting, business or education purposes. Unsurprisingly, in the light of this, four out of five motorcycle trips were made during the week and Sundays showed the lowest level of motorcycle use.

Very little research has been done in this country on the types of crashes experienced by motorcyclists. Motorcycle accidents have somewhat different characteristics when compared with other vehicle groups. KSI casualties in the UK peak through the 20–39 rider age bands, and motorcycles are over-represented in right of way violation (ROWV) accidents, accidents involving running off the road on bends, and accidents that are related specifically to the sort of manoeuvres that motorcycles can perform, e.g. overtaking other traffic without crossing the centre line or 'filtering' between lines of traffic. Preusser et al. (1995) found that a subset of fatal motorcycle accidents with characteristics similar to these accounted for around 85% of the total, in a sample of over 2,000 such accidents. One of the most widely quoted in-depth US study, by Hurt et al. (1981), also highlighted the high frequency of ROWVs and single vehicle accidents on bends in a sample of over 3,000 motorcycle accidents. Moss (2000) focussed attention on rural motorcycle accidents in Cheshire, and found that sports bikes and riders in the 26–40 age group accounted for the majority of rural bend accidents.

Chesham et al. (1993) reviewed the changing focus of research activity in the area of motorcycle safety. They found two main periods of time with a different emphasis. The first period covering the 1970s was based on actual accident analysis in which control factors that contribute to the *severity* of motorcycle accidents were examined (such as drink driving). The second period in the 1980s considered the actual *process* of motorcycle riding, focussing on, for example, rider skills. They go on to say that the 1990s brought a third area of consideration in which *riders' beliefs and attitudes* about road safety are being considered.

Mannering and Grodsky (1995) point out several reasons why the characteristics of motorcycle accidents differ from those of other vehicles. Firstly, they claim car drivers 'tend to be inattentive with regard to motorcyclists and have conditioned themselves to look only for other [cars] as possible collision dangers'. Motorcyclists themselves often repeat anecdotal stories of the car driver's 'sorry I didn't see you' explanation for collisions. Secondly, Mannering and Grodsky (1995) also claim that motorcycle operation is typically a more complex task than car driving, requiring excellent motor skills, physical co-ordination and balance. Motorcycle riding can also involve counterintuitive skills, such as 'counter-steering, simultaneous application of [mechanically separate] front and rear brakes, and opening the throttle while negotiating turns'. Any impairment (for example, from medication or alcohol) would therefore more greatly affect a motorcyclist's risk of an accident when compared with a similar level of impairment while car driving. Sun et al. (1999) have argued that, for this reason, legal blood alcohol levels should be lower for motorcyclists than the level set for other drivers in the USA.

Mannering and Grodsky (1995) also state that, because motorcycle riding is well known to be a dangerous activity, it 'may tend to attract risk-seeking individuals, in all age and socio-economic categories', which would have a corresponding effect on the total motorcycle accident figures. Some evidence of another aspect of risk-seeking among motorcyclists was found by Sunderstrom et al. (1999) in their study of casualties at a US hospital's trauma centre. They discovered evidence that the use of illegal pharmaceuticals had declined markedly in car driver casualties over a 10-year period, but not among motorcycle rider casualties. In addition, the use of alcohol, cocaine and PCP ('angel dust') was found to be higher among injured motorcyclists than among injured car drivers.

Lastly, Mannering and Grodsky (1995) point out that most motorcycles offer a substantially better performance when compared with cars, due mainly to their far higher power to weight ratio. The higher engine capacity sports machines offered for sale in the USA and UK frequently boast acceleration rates of 0–60 mph in less than three seconds. Mannering and Grodsky report that 'some motorcyclists cite as the primary reason for selling their sport bike the fact that they are unable to resist the temptation to ride at dangerous speeds'.

Rutter and Quine (1996) looked at age and experience in motorcycling safety, and from a national prospective survey of over 4,000 riders in the UK found that age played a much greater role than inexperience in explaining why young age groups are over-represented in casualty statistics. Rutter and Quine explain that more emphasis should be given to the consequences of dangerous riding and why training is so important: 'Only when a proper set of underpinning beliefs and perceptions is provided for behaviour will skills be turned into safety'.

Concerning 'ROWV' accidents, Hurt et al.'s (1981) study found that, in multiple vehicle accidents, the driver of the other vehicle violated the motorcyclist's right of way and caused the accident in two-thirds of all such accidents. Keskinen et al. (1998) found that *older* drivers have problems at intersections but seem to be able to cope with other traffic situations comparatively better than younger drivers. Young, middle-aged and older male drivers' habits at T-junctions were examined, the focus of interest being on the attention and interaction between drivers of different age groups. Time differences were noted (i.e. the time passing from the moment the turning driver had completed his/her turn until the opponent driver on the main road reached the centre of the intersection). Two notable conclusions were reached. Firstly, older drivers have a habit of driving and accelerating slowly, and accelerating slowly may shorten the time difference when entering the main road. Young drivers/riders, on the other hand, tend to travel faster. 'An older driver turning and a young driver approaching [could therefore] create a potentially dangerous combination with a low safety margin' (Kestinen et al. 1998). Crucially, time differences were also found to be particularly short when the opponent driver was riding a motorcycle.

A review by Brown (2002) of work relating to drivers' 'looked but failed to see' accidents examined some of the psychological processes that might occur in drivers reporting this type of accident. Of particular note was Duncan's (1996) 'integrated competition hypothesis', which suggests that attention to some kinds of object in road traffic scenes may be inhibited as drivers concentrate on features of the traffic scene which their experience has shown to be of critical importance. In addition, Treisman's (1996) 'feature integration theory' suggested that drivers might rapidly scan the traffic scene for a single feature of a potential hazard, such as proximity, and decide to proceed without noticing the approach of a more distant but rapidly approaching vehicle. Perception experiments by Mack and Rock (1998) have also shown that subjects may be *less* likely to perceive an object if they are looking at it directly than if it falls outside the centre of the visual field, a phenomenon which they call 'inattentional blindness'. Brown (2002) notes that theorising in this area has been considered somewhat controversial, but further investigations of such perceptual factors could clearly have great importance in the understanding of motorcycle accident causation.

Much of the literature suggests that rider attitudes and the perception of the risks involved in motorcycling are the most important consideration when deciding to what extent motorcyclists are at risk from injury compared with other road users. Mannering and Grodsky (1995) surveyed motorcyclists' perceived likelihood of being involved in an accident and concluded that motorcyclists do have a reasonable grasp of factors that can increase the likelihood of accident involvement, highlighting in particular miles ridden, speeding and dangerous overtaking manoeuvres. Their findings suggest that, for the most part, motorcycle accidents are not the result of misjudgement regarding the overall risk of motorcycling.

Everett et al. (2001), however, examined national trends in transportation-related injury risk and safety behaviours among US high school students, and they found that many young people place themselves at unnecessary risk from motor vehicle and bicycle related crash injuries and fatalities because of drink driving and the improper use of safety equipment (including motorcycle helmet use).

Cross-national differences in risk-perceptions in Japan and the US were examined by Hayakawa et al. (2000) who found that objective differences in risk environments combine with cultural influences, which, in turn, leads to differences in risk perception. Raising a motorcyclist's perception of risk would, therefore, seem to be a logical way of improving a motorcyclist's riding behaviour.

Reeder et al. (1996) examined the opinions and behaviours (and therefore the perceived risk) of young motorcyclists in New Zealand. An examination of the literature found three broad areas of concern; the extent and use of protective gear, motorcyclists' level of conspicuity, and risky and illegal behaviour. Very importantly they found that there was a difference between the riders' opinions and actual practice. 'Protective opinions were much more common than protective behaviours despite a widespread belief in their efficacy' (Reeder et al. 1996). Protective clothing, for example, was often not worn because it was, in many cases, unacceptable to the users. Fashion may be a contributory factor to this, as may be the cost of the clothing itself. The use of headlights in daytime was, however, found to be much more common.

2.2 Methodological issues

The causality of real road accidents can be a difficult phenomenon to study. One possible solution to this is the use of methodology that investigates road accidents after they have occurred, rather than the more familiar psychological research that relies for its method on examination of driver behaviour in controlled environments.

One such well-known approach involves the use of multi-disciplinary accident investigation (MDAI) teams that travel to the site of accidents soon after they occur to collect data. Research such as that of Sabey and Taylor (1980) is based on the work of MDAI teams. Findings were concerned with the proportional contributions to road accidents of the user, environment and vehicle. It is from this work that the much quoted figure of 95% was identified as the proportion of road accidents involving human error. Sabey and Taylor (1980) quoted research carried out in the US that produced much the same figure. They went on to assess driver errors behind this figure by examining the contribution of perceptual errors, lack of skill, manner of execution and various forms of impairment, such as alcohol. One of the most detailed motorcycle accident studies ever made in the US, the Hurt Report (Hurt et al., 1981), also used MDAI teams to produce detailed findings over a high number of case examples.

However, in a review of the work of multi-disciplinary team research worldwide, Grayson and Hakkert (1987) pointed out several disadvantages to such a method. Operational costs are very high, and typically only a small number of accidents can be studied, unless research can be carried out over several years. Although Sabey and Taylor (1980) did study over 2,000 accidents, such a figure is the exception rather than the rule. There is a bias towards injury accidents due to the notification procedure. The accidents sampled are bound to be of a heterogeneous nature, which works against any approach that aims to study a specific problem.

A further criticism concerns the conclusions reached. Despite the vast amount of information collected in such work, ‘definitive conclusions are very limited’ (Grayson and Hakkert, 1987) and have been applied mainly to vehicle design and engineering efforts rather than to human behaviour and road design. According to Grayson and Hakkert (1987), these limitations tend to disappear ‘if an in-depth but not immediate response on-the-spot approach is taken’. They comment that it is also important that any in-depth technique is only really of use if applied to specific areas rather than a large heterogeneous sample of information.

Many studies have used in-depth techniques applied to secondary data sources, such as police reports, interviews and questionnaires. Fell (1976) was among the first to claim that an ‘accident causal schema’ could be constructed from such sources. Fell was of the opinion that in-depth work using police reports, while still having some limitations, could be used to improve the ‘state of the art’ in understanding accident causation.

More recently, Malaterre (1990) used police reports to break down and analyse accidents. Malaterre constructed four stages in his analysis – driving, accident, emergency and collision. The factors identified in his analysis stage were next used in synthesis; the building of prototype cases. Such an approach, Malaterre claimed, focussed effectively on functions not correctly carried out by the driver, which are sometimes difficult to locate. Malaterre's sample was, however, quite small (115 cases) and was also heterogeneous. He ended by concluding that more precise analysis needed to be carried out by referring to complete police accident reports, with all their varieties of information.

It is often overlooked that local council initiatives into examining accident causation at specific locations ('black spots') make much use of police reports to present a full picture of what happened. England (1981) describes the approach as very cost effective when targeting engineering countermeasures, and points out that it has the additional benefit of checking the accuracy of summary statistical information that is held on accidents.

The in-depth technique itself has been used in areas outside accident causation for some time. The examination of in-depth case study techniques by Yin (1984) shows how they are primarily of use in producing analytic generalisations rather than more traditional statistical generalisations. They concentrate on an iterative type of explanation building that often features chronologies, sequences and contingent event analysis.

Case study methods were used by Clarke et al. (1998a) in the analysis of police road accident files in right-turn accidents, a key feature of this work being that it treated accidents as a 'clinical' problem, rather than just an 'epidemiological' one as in many traditional approaches. For the first time sequence analysis was used in conjunction with rule-finding computer software. This approach concentrated on the relatively homogeneous class of right-turn accidents to produce new findings. It was, however, felt that much of the information from the original police reports was being lost. The rich nature of an accident report that made it understandable to a human observer had to be left out when the data were being prepared for computer analysis. Subsequent work investigating overtaking accidents, by Clarke et al. (1998b), placed more emphasis on the interpretation of causal patterns by the human coders, but retained the powers of a computer database for the later stages of storing, sifting and aggregating explanatory models of individual cases. This later approach was continued in the present study. The method has been further developed over the years in this research group and is reported in detail in Clarke et al. (2002).

3 METHOD

Our method largely relies on the human interpretation of road accident case reports. Furthermore, the construction of interpretations, typologies and models has not been driven by theory in the main but has been generated primarily from the data itself, although theoretical models are acknowledged. The most attention is given to the full sequential nature of the accident story in each individual case, which is where the technique of qualitative human judgement methodology proves more useful than more traditional statistical methods applied to aggregated data.

The first step was to draw a heterogeneous sample of police road accident files involving motorcyclists. The files were found to contain varying amounts of information depending on the circumstances of the accident and any subsequent legal proceedings. The minimum contained in each file is a report sheet/card, which is a summary of information about the accident, such as date, time, location, weather conditions, junction type and many other items. The sheet also includes a brief accident story as interpreted by the attending police officer. This is constructed by the officer a short time after the accident by reference to his or her pocket book. It contains the actions and, in some cases, the reported intentions and behaviours of riders and witnesses.

In addition to the report sheet/card, the most detailed files (classed as ‘A’ grade) contain a range of further items, which help to fill out the often complex circumstances of the accident. These include maps, photographs, statements of vehicle examiners and, perhaps most importantly, interview and witness statements, which are rich in information. The interpretation consists of the reconstruction of an entire accident story from the information available in the police file. Details from somewhat less detailed files (classed as ‘B’ grade) are also entered for purposes of statistical comparison.

3.1 The accident database

The data were entered into a FileMaker Pro database customised to handle the information and search parameters required for this project. Figure 1 shows the standard data entry set-up.

Figure 1: A standard data entry sheet on the database

Rider 1 Age 26 — ◉ M ○ F
Driver/Rider 2 Age 26 — ◉ M ○ F

Vehicle 1 Owner Owner rider
Primary blame Driver/Rider 2 — ○ Active ◉ Passive

Severity Slight
Date 9/12/97
Day Tuesday
Time 24hrs 18:15
Road Type A class
Speed Limit 30
Area ○ Rural ◉ Urban

Grade of info. ◉ A ○ B
- ☒ Independent witnesses
- ☐ Vehicles examined
- ☒ Sketch map
- ☐ Photographs
- ☐ Licence records

Road Features
- ☐ T junction
- ☐ Crossroads
- ☒ Traffic lights
- ☐ L/H bend
- ☐ R/H bend
- ☐ Roundabout
- ☐ Dual carriageway
- ☐ Hillcrest
- ☐ Dip
- ☐ Sliproad
- ☐ Other…

Lighting Darkness, street lamps lit
Weather Damp
Road Conditions Damp
Special Road Conditions/Environment ○ Present
DOB Verified? ◉ yes ○ no
Days STP ?
Years STP 0

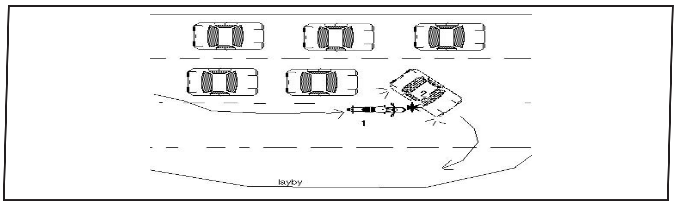
Types of Vehicles 1- Yamaha RXS100
Drivers Familiar ? yes, both
Pillion? None
Pillion age, sex N/A
Test Pass Date
Charges 2- DWDC, failure to report

Motorcycle cc 98 **BHP**
- ☒ Helmet (BSS approved)
- ☐ Visor up
- ☐ Visor down
- ☐ Full
- ☐ Open
- ☐ Jacket
- ☐ Trousers
- ☐ Boots
- ☐ Daytime lights
- ☐ Reflective clothing

Licence Type Full
Length of Ownership n/k
Motorcycle Category Traditional

Prose Account It was early in the evening on a damp night in winter. It was dark and street lamps were lit. It had been raining lightly for between five and ten minutes. The rider (M,26) of a small Yamaha motorcycle (1) was travelling along a busy and wide urban A road with a 30mph limit. The road was wide enough for two lines of traffic in queues, and traffic was moving very slowly. Rider 1 travelled through some traffic lights on green at a crossroads, and was almost immediately confronted by stationary queuing traffic on the left-hand side of the road ahead. He also saw that there was no traffic coming from the other direction, as this had stopped for a set of red lights around

Map



Purpose of Journey Work
Other Riders? Alone
Known Modifications?

Minimum Set of Explanations
Driver 2:
C2.1 Poor observation; didn't look in relevant direction (rear offside)
C3 No signalling

PF 5 **CF1** 14A **CF2** 9A **CF3** **CF4**

Alc. Level N/A
Avoiding Action Attempted none
Violation / Error type Overtaking
Turns N/A
Shunts N/A

Comments / Quotes/ Special Factors
Police: "Why didn't you see the bike?"
Driver 2: "I didn't expect to see anything - it was the oncoming traffic's lane."
Police: "Did you check your wing mirrors?"

Speed cameras/ Police presence ○ Present
Filtering? ◉ yes

Rural Bend Errors
Shunt errors

CM Rider 1 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐ 13 ☐ 14 ☐ 15 ☐ 16 ☐ 17 ☐ 18 ☐ 19 ☐ 20 ☐ 21 ☐ 22 ☐ 23 ☐ 24 ☐ 25 ☐ 26 ☐ 27 ☐ 28 ☐ 29 ☐ 30

CM Other ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐ 13 ☐ 14 ☐ 15 ☐ 16 ☐ 17 ☐ 18 ☐ 19 ☐ 20 ☐ 21 ☐ 22 ☐ 23 ☐ 24 ☐ 25 ☐ 26 ☐ 27 ☐ 28 ☐ 29 ☐ 30

Data are entered describing the relatively objective facts of each case: time of day, speed limit, class of road, etc. The database includes some fields configured as check boxes or 'radio buttons'; these provide quick access to selected cases during further analysis. Summary fields are also used to calculate things such as the mean age of the involved riders. Any combination of fields in the database can be used to search for cases matching a variety of criteria. A variety of layouts are also used to present and analyse the data, in addition to the data entry layout above.

A 'prose account' is also entered for each case giving a step-by-step description of the accident. The causal story is always written from the viewpoint of the motorcyclist, who is labelled as 'rider 1', though much consideration is also given to other road users' actions and intentions. The prose accounts give a detailed summary of the available facts, including information from witnesses that appears to be sufficiently reliable. Discrepancies can occur between the interviews of riders and the statements of independent witnesses, but these can usually be resolved by considering all the statements together with various other reported facts. These can include the measurement of skid marks by police, vehicle damage reports, etc. Figure 1, it should be noted, only shows part of a typical prose account because the text is held in an 'expandable field' in the database.

Next, a sketch plan of each accident is made from sources in the file. The orientations of the sketch plan and the icons contained in it are standardised for the speed of entry and to allow direct comparisons between example or prototype cases.

A minimum set of possible explanations for each accident is recorded from a standard checklist adapted and developed from a previous study (Clarke et al. 1998b). The list has subsections for the road environment, vehicle and rider characteristics, and specific rider actions. The emphasis throughout is on giving the finest grain description possible of each accident, not for use as a formal coding scheme but rather to provide search and selection aids to identify homogeneous groups of cases for further qualitative analysis. In addition, we entered data for a version of a national 'contributory factors in accidents' form developed at the Transport Research Laboratory (TRL) which involves the identification of one major precipitating factor (PF) from a possible list of 15, and a further coding of up to four contributory factors (CFs) together with a confidence rating in the CFs identified. Finally, entries are made in additional fields for comments and quotes from the involved riders.

The ultimate aim of entering facts and figures, prose accounts, standardised graphics and explanatory factors in the database was to build a library of analysed cases stored as a series of case studies. In this sense, the database is used to find groups and recurring patterns, rather than being considered as 'raw' data awaiting analysis. In this way it was possible to find patterns, sequences and processes within each group of accident. Statistical examinations were not the primary focus of the study, even though simple statistics were used to characterise the sample.

3.2 The questionnaire

An examination of the attitudes of motorcyclists was the next and final phase of the research process. A quantitative approach was used in the form of a questionnaire survey as this seemed to be the most appropriate method given the aims and constraints of the project.

The questionnaire was designed to be completed without any help from the researcher, therefore minimising the possibility for influencing respondent's answers. Secondly, the respondent's anonymity could be assured as respondents were given the option of not supplying any information that would specifically identify them. This was particularly important for this study as some of the questions required the respondents to admit to potentially incriminating information, such as breaking the speed limit or driving while under the influence of alcohol. It was for this reason that the respondents were given the option to remain anonymous.

There were four main sections to the questionnaire focussing on rider's experience, training undertaken, safety issues and personal details (for background purposes). A final version of the questionnaire can be found in the appendix of this report.

The Motorcycle Action Group (MAG) is a political pressure group with approximately 45,000 members in the UK, who exist to promote rider's rights and welfare. All branch representatives were contacted via email to enquire if they would be willing to ask their members to complete a questionnaire. In addition, contact was made with the Public Liaison Manager at the group's central offices who agreed to put a copy of the questionnaire on the group's website for riders to either print out and return by post or to fill in electronically. A notification of the questionnaire was also included in a monthly email sent to all MAG members in summer 2003 alerting them to the questionnaire.

4 RESULTS

A total of 1,790 motorcycle accident files have been examined. There were 1,003 (56%) of the most detailed 'A' grade type. The majority of accidents occur in urban or suburban areas (73.7%), but there are over five times as many bend accidents in rural areas as there are in non-rural areas. Rural accidents are over one and a half times more likely to be serious and over three times more likely to be fatal in outcome than accidents in built-up areas, no doubt partly due to the higher speeds at which they can occur. There were 43 fatal accidents (2.4%) and a further 520 (29.1%) involving serious injuries to a rider. Figures 2 and 3 show the age and gender distribution in the sample as a whole.

Figure 2: Age distribution of motorcyclists in sample (n = 1,790)

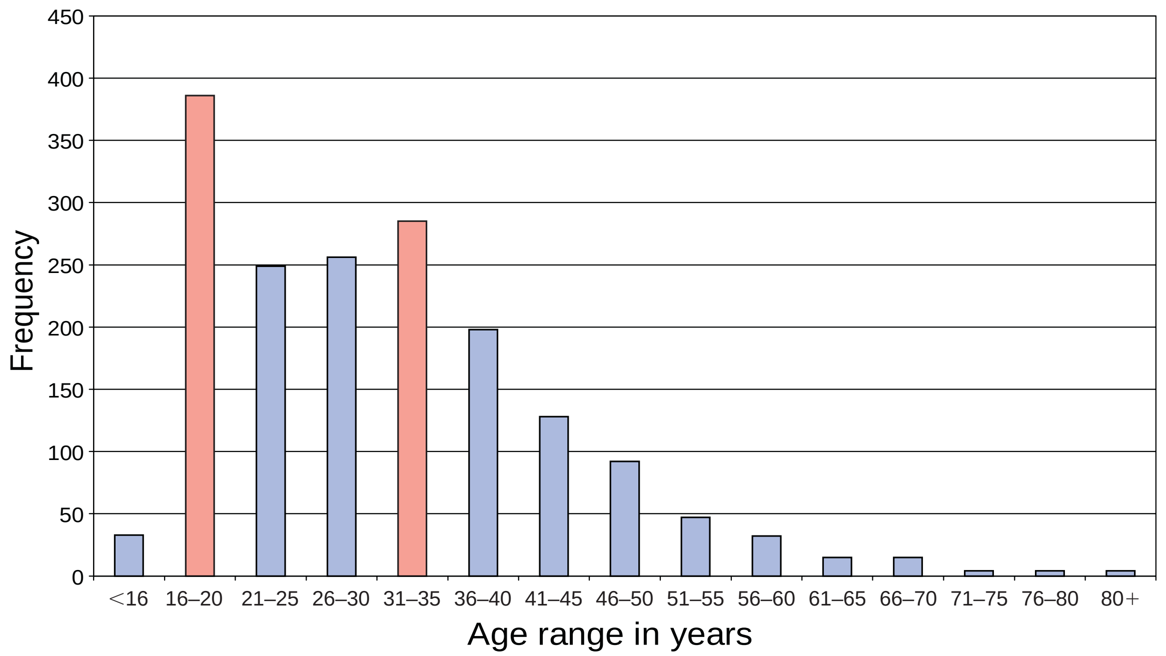
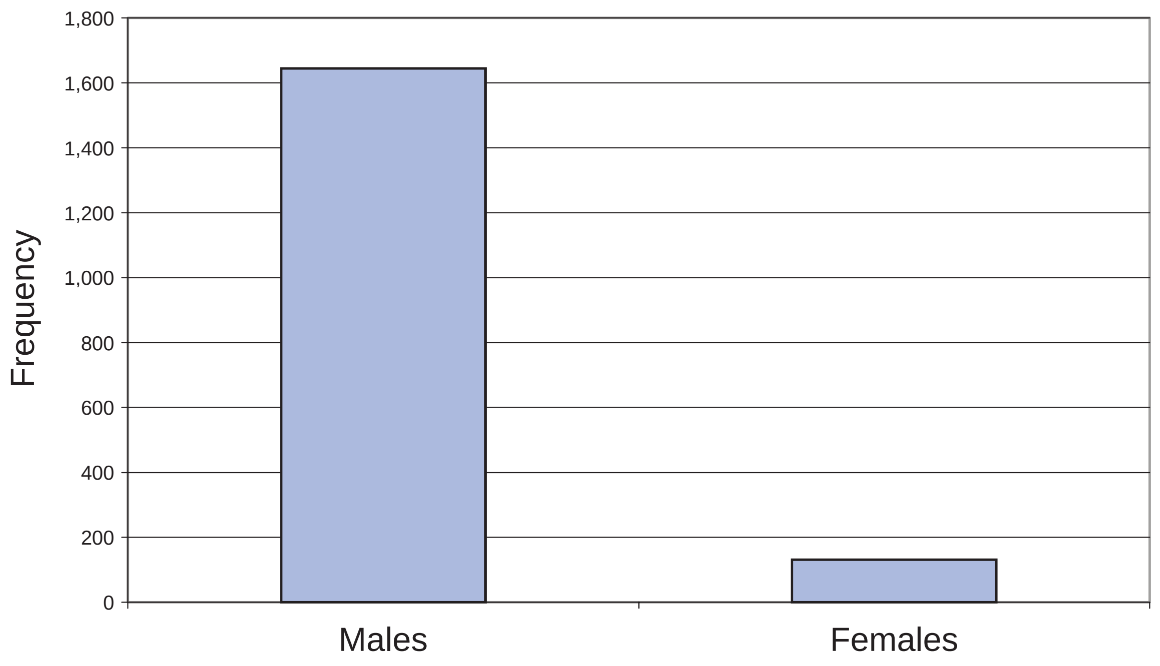


Figure 3: Gender of motorcyclists in the sample (n = 1,790)



There appear to be two peak age ranges for accident involvement, 16–20 years and 31–35 years (both highlighted in Figure 2). It can also be seen from Figure 3 that there are over 12 times as many male accident-involved motorcyclists as females. This is remarkable in that, according to the National Statistics/DfT (2003) National Traffic Survey for 1992–2001, men were only seven times more likely to make a motorcycle trip than women, so it would appear that there are more than one and a half times as many accident-involved male motorcyclists in the sample than might be accounted for by male riders' level of road use. This is, however, possibly due in part to male riders having higher average trip mileages than females.

To examine the effect of age further, the age range in the sample was broken into 13 bands and O-E/√E was computed, which can be treated as a standard normal residual. This measure is therefore based on the χ^2 statistic and attempts to provide an induced exposure measure by finding combinations of a 'row' feature and 'column' feature which are considerably over-represented in the data, even when mere coincidences have been allowed for (Colgan and Smith, 1978). For each cell, O-E/√E is calculated and the resulting figure is evaluated against the square root of the upper 5 percentile point of the appropriate χ^2 distribution divided by the number of cells in the table. Here, a figure exceeding +/−1.06 is approximately equivalent to a significance level of $p < 0.05$, and the null hypothesis is that there is no interaction, i.e. differences between accident type are unaffected by age, and vice versa. Table 1 shows standard normal residuals for the 13 age bands of riders across three different accident types, and the significant figures are highlighted.

Table 1: **Standard normal residuals for three types of accident and 13 age bands of motorcyclist; for cases where motorcyclists have been judged fully or partially to blame for the accident**

Acc. type/age	<16	16–20	21–25	26–30	31–35	36–40	41–45	46–50	51–55	56–60	61–65	66–70	70+
ROWVs	0.167	1.456	−0.506	−1.173	−0.186	0.010	−0.582	−0.171	1.742	−1.486	−0.495	0.308	1.602
Bends	0.950	−1.233	−0.175	1.345	0.294	0.058	−0.426	0.441	−0.037	0.030	0.850	−0.273	−1.479
Overtakes/filtering	−1.263	0.168	0.652	−0.548	−0.182	−0.076	1.012	−0.369	−1.490	1.271	−0.563	0.050	0.330

It can be seen that young motorcyclists (16–20 years) seem to have an increased propensity for being at fault in ROWV accidents. Other age groups are not over-represented in this type of accident, with the exception of two groups, those over 70 and the 51–55 age group. This last finding must be treated with caution, however, as the numbers of motorcyclists in the older age bands are quite small. Motorcyclists aged 26–30 years seem to have an increased propensity for going out of control on bends, with those over 70 showing less propensity. There appears to be an anomalous result in the neighbouring age bands 51–55 and 56–60 years for overtakes/filtering, but, again, the numbers of motorcyclists in the older age groups for this type of accident are quite small.

When all three groups of accident are examined according to *time of day* and *day of the week* on which they occur, the following patterns are revealed (Figures 4 and 5).

Figure 4: Frequency of three types of motorcycle accident by time of day

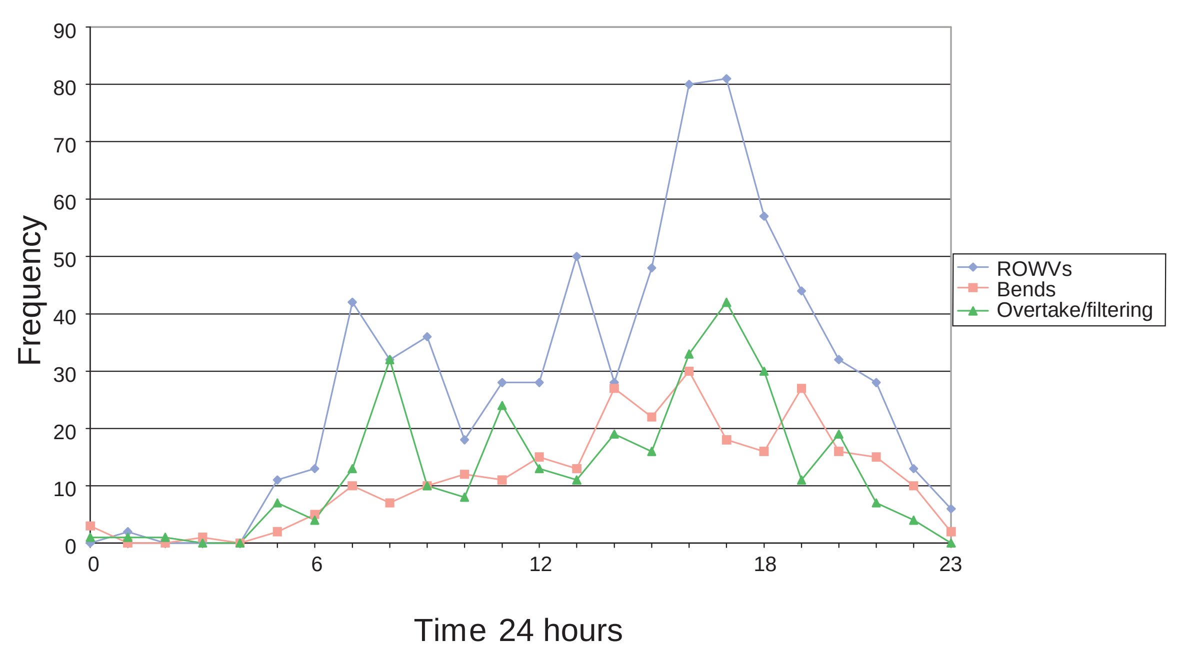
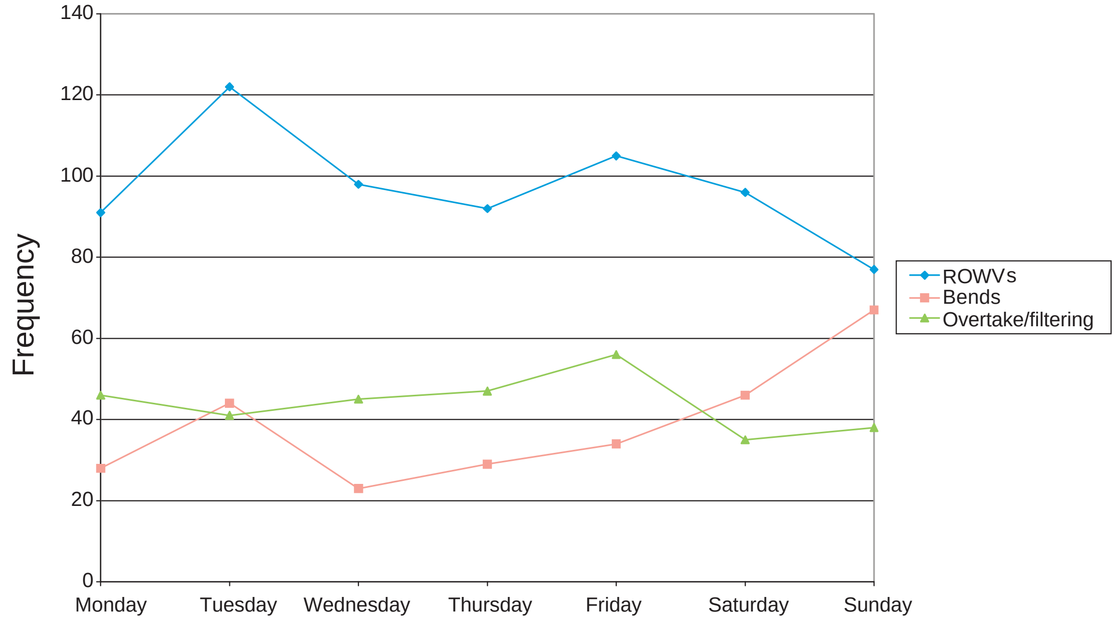


Figure 5: **Frequency of three types of motorcycle accident by day of week**



It can be seen in Figure 4 that, while ROWV and overtake/filtering accidents cluster around times of peak traffic flow in the early morning and late afternoon, bend accidents show peaks in the afternoon and early evening. This suggests that these accidents might be associated more with 'recreational' riding than the other two types. This assertion is also backed up by the peak in bend accident frequency on Sundays shown in Figure 5, and the fact that, of cases where the purpose of the rider's journey is known, bend accidents show the highest percentage of riding for pleasure rather than for work/commuting/other purposes. However, it is important to remember that the figures above take no account of the level of motorcyclists' exposure at different times, or on different days, so these findings must be treated with some caution.

4.1 Right of way violations

Of the total cases, 681 (38%) involve ROWVs. However, less than 20% of these involve a motorcyclist who rated as either fully or partly to blame for the accident. The majority of motorcycle ROWV accidents have been found to be primarily the fault of other motorists. This is an even higher level of 'non-blameworthiness' in ROWV accidents than that observed in other in-depth studies, e.g. Hurt et al. (1981)

The majority of ROWVs occur at T-junctions, which are three times as common as roundabouts or crossroads. This finding is in accordance with the work of Hole, Tyrell and Langham (1996), who found that the majority of such accidents occurred at 'uncontrolled' (i.e. no stop light or sign with only give-way markings and/or signs present) T-junctions in urban environments.

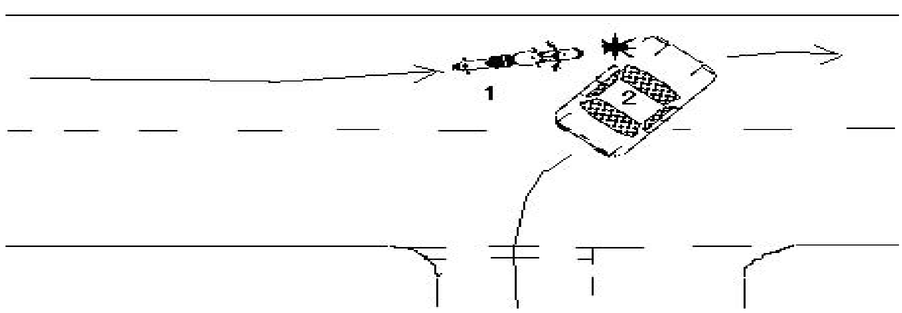
When these cases are examined, it can be seen that the most common failure of other drivers in motorcycle accidents is a failure in the continuity of their observation of the road scene. Over 65% of ROWV accidents where the motorcyclist is not regarded as to blame involve a driver who somehow fails to see a motorcyclist who should be in clear view, and, indeed, frequently *is* in view to witnesses or other road users in the area. Failures of observation that involve drivers failing to take account of restricted views of one kind or another, and failing to judge the approach speed and/or distance of a motorcyclist, are *not* included in this category. Sometimes, accident-involved drivers in motorcycle accidents fail to see riders even when they are verifiably using visibility aids, such as daytime running lights and high-visibility protective clothing. This occurs in over 12% of such cases (but the level of use of these aids to visibility is felt to be under-reported by police). An example of such a case is given in Figure 6.

Figure 6: Example of driver failure to see a motorcyclist in an ROWV accident

Story:

It was early in the afternoon on a fine spring day. The rider (M,44) of a Honda CBR1000 motorcycle was travelling along an unclassified urban road at around the 30 mph limit. According to witnesses, he was not going above the speed limit and was displaying daytime lights. As he approached a junction ahead on the offside, he could see a Vauxhall Astra (2), driven by (F,63) waiting to turn right at the give way line to travel in the same direction as him. As he got to within 20 metres of the junction mouth, the car driver began to emerge, making her right turn. The motorcyclist braked heavily and steered nearside in an effort to get his bike between the nearside kerb and the turning car before he hit it. However, he was unsuccessful in this, and he hit the nearside of the car as it turned, causing a severe injury to his right hand that required two operations and several months off work. The Astra driver claimed that she had looked left, but had simply not seen the motorcyclist, despite the fact that visibility was good and the rider was displaying lights. She was charged with driving without due care and attention.

Diagram:



4.2 Losing control on bends

Over 15% of total cases involve loss of control on a bend, corner or curve. This type of accident is almost always regarded as primarily the fault of the motorcyclist rather than other road users, and it has already been shown that such accidents are more associated with riding for pleasure than accidents of other types. Hurt et al. (1981) found that rider error in such cases consisted of 'slideout and fall due to overbraking, running wide of a curve due to excess [inappropriate] speed, or under-cornering', which seem also to be the most frequent rider errors in bend accidents in this sample.

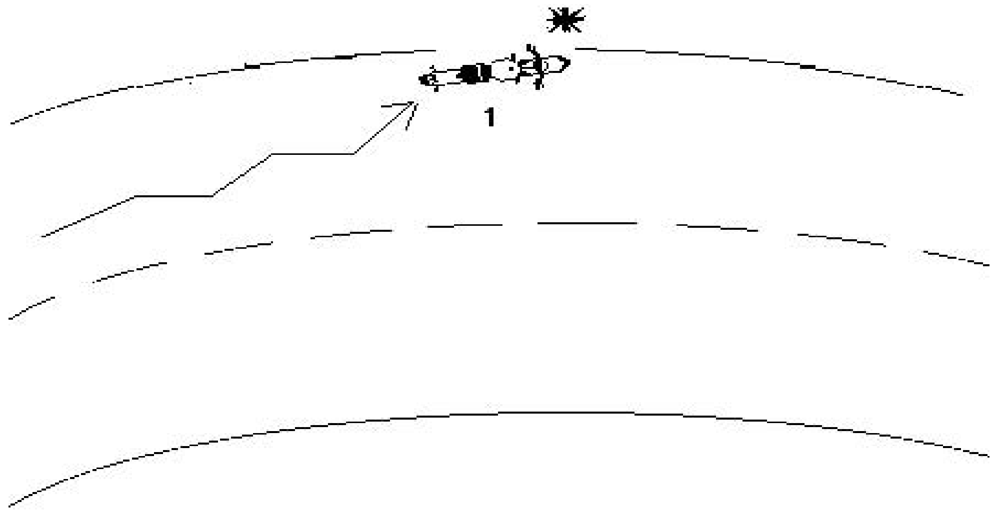
Riders having this type of accident are nearly three times as likely (compared with the whole sample) to be rated as 'inexperienced' riders by researchers; this usually occurs when it has been noted by an investigating police officer that some form of inexperience was a factor, e.g. a rider who has only very recently passed the motorcycle test. Interestingly, such accidents appear no more likely than accidents of other types in the sample to occur on damp, wet or icy roads, though there is some evidence of a problem with riders hitting oil, gravel and mud in some rural bend accidents. Though inappropriate speed for the bend is implicated in a large proportion of cases, there are also a number of cases where there seems no evidence of any failure except ones relating to lack of experience, as in the fatal example shown in Figure 7.

Figure 7: An example of a fatal bend accident caused by inexperience

Story:

It was late in the evening on a fine night in autumn. The rider (M,28) of a Kawasaki ZZR 600 motorcycle (1) was travelling along a rural B road with a 60 mph limit and streetlights. He was out for a pleasure ride with another friend of his who was ahead of him. Both riders had taken direct access intensive motorcycle courses to gain their full licence and rider 1 had passed his test 11 days before. He had picked up the Kawasaki that day. The two riders travelled round a right-hand bend. Although the bend was not so severe that it could not be taken at the legal maximum of 60 mph, rider 1, who was following his slightly more experienced friend, failed to take the bend correctly even though he was not exceeding the limit. His bike hit the nearside kerb and he was thrown into the road. The bike was a write off and the rider received multiple injuries from which he died. Police put the cause of the accident down to an inexperienced rider riding an unfamiliar machine.

Diagram:



The riders in this 'going out of control' category seem to fall into two groups. There are those riders who have a full motorcycle licence, but perhaps either have not held it for a long time (as in Figure 7) or have returned to motorcycling after passing a test some years ago (so called 'born again' bikers). The mean age of these riders considered together is 29.7 (standard deviation 10.3), and of those cases with licence records available, they have a lower mean number of years experience (5.3 years of full licensure) than the equivalent group derived from the sample by excluding 'going out of control' accidents (7.2 years of full licensure). Of accidents where the rider is rated fully or partly to blame for the accident, nearly one-third of the accidents in the 31–35 year old age range involve going out of control on a bend, which perhaps contributes to the peak in this age range shown in Figure 2.

Then there is a group of riders who either have only a provisional licence or, sometimes, no licence at all, who can be regarded as perhaps the least experienced riders in the whole sample. The mean age of this group is 22.6 (standard deviation 8.8). The latter group has approximately twice the proportion of fatalities found in the former group (though caution must be exercised in the interpretation of these findings, as frequencies are quite low). Again, of accidents where the rider is rated fully or partly to blame for the accident, 20% of the accidents in the 16–20 year old age range involve going out of control on a bend, which again perhaps contributes to the peak in this age range shown in Figure 2.

4.3 Motorcycle manoeuvrability accidents

We have identified a subgroup of the sample cases that comprise accidents specifically related to the way motorcyclists are able to manoeuvre their vehicles in ways that are frequently not appreciated by other motorists. Even small capacity motorcycles have a high power-to-weight ratio, and nearly all motorcycles are small enough to make use of unoccupied road space between other traffic that larger vehicles are unable to use.

If all accident cases where the rider is judged either fully or partly to blame are examined (n = 919), 16.5% involve a motorcyclist overtaking other vehicles and causing an accident. These riders have a tendency to be slightly younger than the rest of the sample, and the indications are that they have a tendency to be riding machines of a higher engine capacity than other accident-involved drivers (mean cubic centimetres of capacity = 507, versus 431 for riders to blame/partly to blame in other types of accident). Perhaps surprisingly, there is no evidence that the two peak age ranges identified in Figure 2 (16–20 years and 31–35 years) are over-involved in overtaking accidents when compared with the rest of the sample.

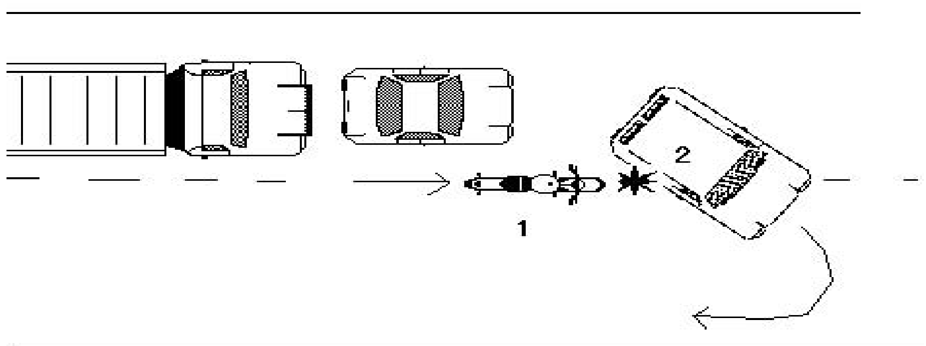
However, motorcycle accidents also occur when riders take the opportunity to pass slow moving or stationary traffic, which is often referred to as 'filtering'. Though only slightly more than 5% of the whole sample identifiably involve a rider filtering, other drivers are more than twice as likely to be considered at fault in such accidents as the motorcyclists involved, though there is also evidence for an increased proportion of 'combined fault' accidents in this category. It seems that motorcyclists are, as it were, 'subverting' other drivers' expectations of how traffic behaves, in some cases. An example of this is shown in Figure 8.

Figure 8: An example of a driver causing an accident by failing to take into account possible motorcycle riding strategies in heavy traffic

Story:

It was dark on a fine December evening. It was not raining but the road was damp. The rider (M,47) of a Honda CBR600 motorcycle (1) was passing a queue of stationary traffic on a single carriageway A class road with a 60 mph limit when the driver (M,56) of a Vauxhall Astra Van (2) pulled out of the line of traffic with the intention of making a U-turn and collided with the motorcyclist who was knocked from his bike and sustained an black eye, bruised nose and sprained shoulder. Driver 2 admitted to not seeing the motorcycle and not looking properly after assuming that the vehicles behind were stationary, he had clearly not considered the possibility of a motorcycle passing the traffic. Several witnesses clearly put the blame with driver 2 who was charged with driving without due care and attention. One witness however thought the motorcyclist was travelling a little fast but there is no evidence to support this.

Diagram:



At his police interview, the driver in the above case made the following statement: 'There could be nothing coming from behind me because the car and lorry to my rear were stationary'.

4.4 Other motorcycle accidents

Though the majority (70%+) of motorcycle accidents are covered by the scenarios outlined above, the remainder contain some special areas of interest. One such is rear-end shunt accidents. Rear-end shunts have been found to be among the most common types of accidents for all drivers. West and French (1993), in their analysis of different types of shunt, found that 'active involvement in shunts was a function of being young and male'. Shunts account for over 11% of all motorcycle accidents in the sample, and riders are typically found to be more likely to be at fault than in accidents of other types. The evidence is that 'at fault' riders in shunt accidents tend to be younger, more inexperienced riders, on smaller capacity machines. Nearly 40% of them are riding scooters and mopeds, motorcycle types which account for only 17% of machines in other types of ‘at fault’ accident. It could be that these relatively inexperienced riders are experiencing difficulties in bringing their machines to a controlled stop, especially in wet and slippery road conditions. Lightweight bikes with separate front and rear brakes are relatively easy to break into a skid on. Inexperience in this area can have fatal consequences that would be unlikely on four wheels, as shown in Figure 9.

Figure 9: A fatal rear-end shunt case involving an inexperienced rider

Story:

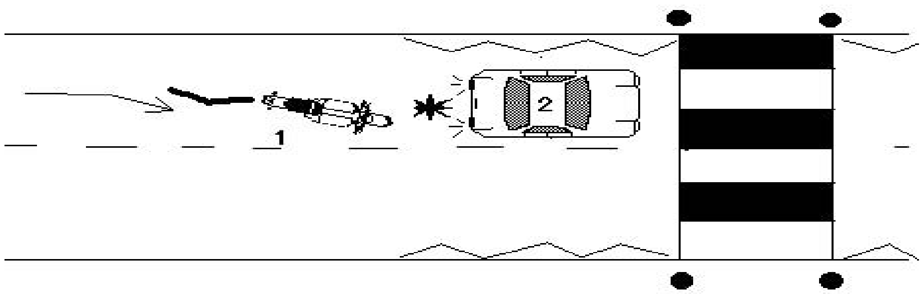
It was early in the morning on a cold day in winter. Dawn had just come up, and it had got light, but most vehicles still had at least sidelights on. The weather was frosty, but the roads had been salted and gritted and, as a consequence, they were quite wet. The rider (M,18) of a Suzuki scooter-style moped (1) was travelling along an unclassified urban road close to his home. He was on his way to work.

The rider was following, at some distance, a Fiat Tempra (2), driven by (M,30). The Fiat approached a zebra crossing ahead, and the driver noticed that there was a paperboy on a bike waiting to cross the road, so he slowed down and stopped in a normal fashion. He remained stopped with the clutch depressed and his foot on the footbrake. The car had its lights on, and the brake lights were therefore illuminated in addition.

The paperboy on the bike began to cross the crossing, and had almost reached the other side, when rider 1 approached the rear of the waiting Fiat. He failed to notice it until too late, and when he did, he applied his brakes quite hard in an attempt to stop behind the car. The back wheel of the scooter locked under braking and skidded to the nearside on the wet road. The rider and machine both hit the road sideways and skidded into the rear of the Fiat, getting trapped under the rear of the car. During the short time the rider was skidding down the road, his full-face helmet came off as the strap was not fastened properly. The rider hit his head on the rear of the car bumper when he collided with it, and received a serious head injury, from which he died a short while later in hospital.

Witnesses and police attached no blame whatever to the car driver. No one could understand why the rider’s helmet had not been strapped on properly, as it apparently had been when he left home that morning some minutes previously. Had his helmet not come off, it was held to be quite likely that he would have survived the accident. One witness described how he saw the scooter rider most mornings, and that the rider always seemed unsteady and very inexperienced on his machine. The coroner recorded a verdict of accidental death.

Diagram:



4.5 Types of motorcycle and engine capacity

According to DfT figures for 2001, the percentages of motorcycles of various engine capacities registered in the UK were as shown in Table 2 below. The equivalent percentages from our sample are shown alongside.

Table 2: Percentages of motorcycles of various engine capacities

Engine capacity	Percentage of total motorcycles, DfT figures, 2001	Percentage accident involved in sample
50cc and under	17.5	14.9
50–125cc	19.5	**27.6**
125–150cc	0.1	0.06
150–200cc	1.5	1.0
200–250cc	4.0	4.3
250–350cc	0.9	1.4
350–500cc	7.0	8.9
500cc and above	49.5	**41.7**

Figures from our sample of accident-involved motorcycles reveals that the 50–125cc band above, which contains machines most often used by young, inexperienced and learner riders, accounts for over 25% of the sample; it seems that these machines are over-represented in accidents relative to their registered numbers. Larger engine capacity motorcycles above 500cc are under-represented in the sample with respect to their numbers on the road, even though they are likely to travel higher mileages than smaller machines. A similar finding occurs when percentage sales figures from the Motorcycle Industry Association (MIA) (for 2002) are compared with percentages of various bikes in the sample.

A slightly more detailed table of engine capacities was produced from the study, shown below in Table 3. This included breakdowns across three types of accident: ROWVs, bend accidents and those involving overtaking/filtering.

Table 3: Numbers and equivalent percentages of motorcycles of various engine capacities across three types of accident

M/cycle cc	N	Mean age of rider	Percentage of total	ROWV	Percentage of total	Bend	Percentage of total	OT/filter	Percentage of total
49–100	301	30.3	19.5	125	21.6	25	10.0	44	16.4
100–250	296	**25.3**	19.1	121	20.8	42	16.9	43	16.0
250–350	79	30.6	5.1	30	5.2	9	3.6	12	4.5
350–500	103	30.0	6.7	38	6.6	19	7.6	19	7.1
500–600	102	**35.3**	6.6	42	7.3	13	5.2	19	7.1
600–900	384	**33.5**	24.8	140	24.2	83	**33.3**	72	26.9
900+	281	**35.7**	18.2	83	14.3	58	**23.4**	59	**22.0**
Total	1546	31.3	100.0	579	100.0	249	100.0	268	100.0

Riders of machines 100–250cc in capacity are significantly younger than other riders in the sample, but this is perhaps not surprising as most 'learner legal' machines fall into this cc band. Riders of machines 500cc and above, and 900cc and above in particular, seem to be significantly older than other riders in the sample. Riders of machines 600cc and above seem to have an above average risk of becoming involved in accidents on bends, and there is also some evidence of an increased risk of accidents involving overtaking or filtering for riders of machines 900cc and above.

The MIA also records annual figures for motorcycles sold of various types, e.g. custom, super-sport, traditional, etc. These categories were also used, where possible, in the study. The figures for 2003 are shown in Table 4.

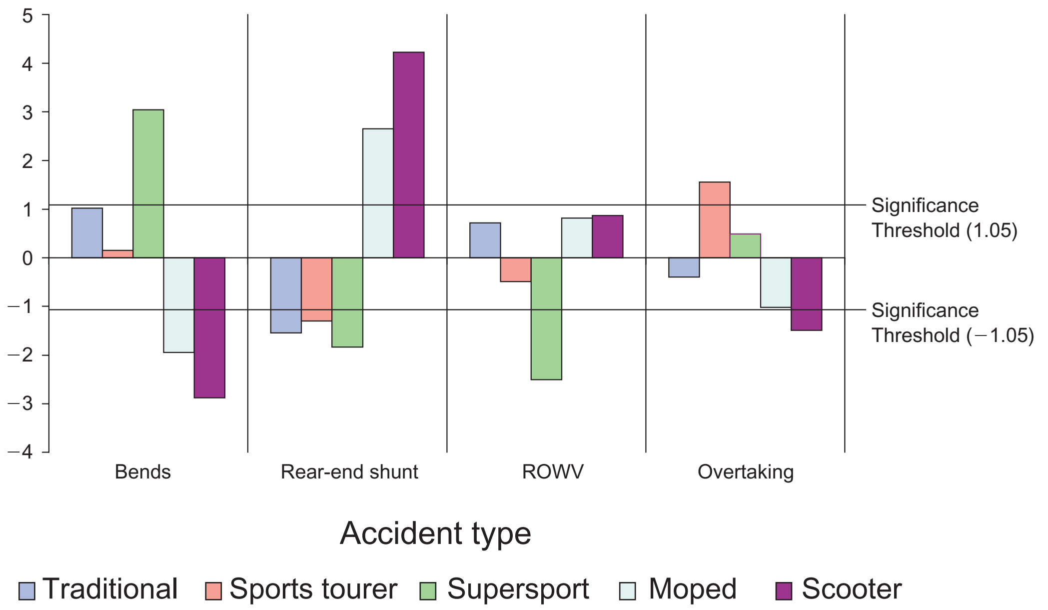
Table 4: Equivalent percentages of motorcycle types in the sample and total sales for 2002 (MIA figures)

M/cs by category involved in accidents	Percentage of m/cs involved in accidents	Percentage of all newly registered m/cs by category in 2002
All scooters and mopeds	29.11	40.94
Adventure sports	0.08	1.86
Custom	2.58	5.23
Sport/touring	10.32	11.54
Super-sport	25.28	19.76
Touring	4.02	3.18
Traditional	25.36	11.67
Trail/enduro	3.26	5.81

The equivalent percentages in Table 4 show that super-sport and traditional bikes appear over-represented in the sample compared to their most recent sales figures. Mopeds and scooters appear (somewhat surprisingly) under-represented. However, it is possible that this seemingly anomalous result in the scooter/moped figures is accounted for by the large increase in the sales of scooters during 2003 (up 16%), which means that they have only become a large category relatively recently, compared to the earlier years that this study was carried out over. They may also do many less miles than machines of other types. There is also some confusion in our sample as some scooters are legally mopeds (i.e. under 50cc) while some are not, which may lead to errors in categorising them correctly. Without the correct recording of exact model designations on some accident reports, it proved difficult to be precise on this point, and many scooters may have been categorised as mopeds by their engine capacity alone as a result. When machines recorded as 'moped' are separated from 'scooters' in the sample, it is found that mopeds in general are over-represented in accidents relative to their sales figures.

Some of the motorcycle categories were also selected for analysis using standard normal residuals (as used with rider age groups earlier), and Figure 10 shows how machines of various categories are over- or under-represented in the sample with respect to the type of accident they are involved in.

Figure 10: Standard normal residuals for five types of motorcycle in four types of accident, for cases where motorcyclists have been judged fully or partially to blame for the accident



It can be seen that super-sport motorcycles are over-represented in bend accidents, but scooters and mopeds are under-represented in this type of accident while being more likely to come to grief in rear-end shunt accidents. Super-sport bikes have a significantly lesser propensity than other types of motorcycle for being involved in both rear-end shunts and ROWV accidents. Somewhat surprisingly, sports-tourer bikes appear significantly over-represented in overtaking/filtering accidents. No type of motorcycle stands out as being over-represented in ROWV accidents, though super-sport bikes appear to be under-represented.

4.6 Impaired riding

When accidents in our sample are analysed for the involvement of alcohol or drugs, it is found that 3.4% of accidents for which the rider is fully or partly to blame involve alcohol (or much less commonly, drugs, which account for under 0.25% of contributory factors). This does not seem to be significantly different to the percentage figure of people failing breath tests at the roadside after injury accidents in the UK as a whole (3.7%, according to Department for Transport figures for the year 2000). However, accidents in the sample where another driver is at fault have an alcohol/drug involvement rate of only 1.3%, which suggests that motorcyclists are more likely to have an accident while impaired through drink or drugs than they are to be hit by another driver who is impaired, i.e. allowing for exposure levels.

Impaired riders are significantly more likely to be younger than other ‘at fault’ riders, and they are more likely to be violating licensing laws by riding while already disqualified, having no licence, or breaking the terms of a provisional licence; there is therefore some evidence of a ‘multi-offending’ group in this type of accident. Deliberate riding at over the speed limit, loss of control and other deliberate actions, such as riding without a safety helmet, are all more common in this group of riders.

4.7 Questionnaire results

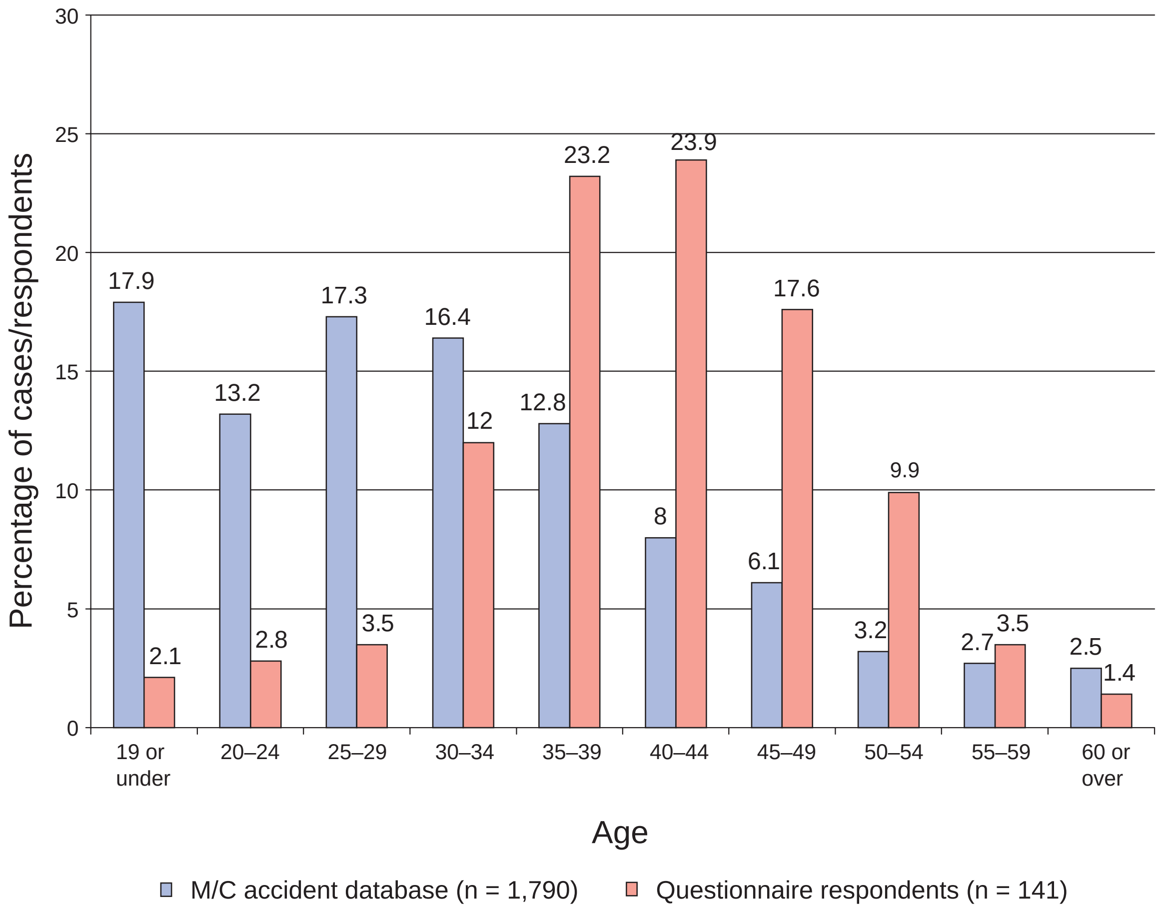
The findings that have emerged from the questionnaire survey are now considered. The results will look at the motorcyclist’s personal details, experience, riding habits and views and opinions of road safety using data obtained from the motorcycle safety questionnaire. These results will be considered alongside results from the motorcycle accident database. In the results that follow, it should be remembered that neither sample is random, representative or matched; indeed, there is good evidence that the questionnaire respondents are (generally) middle aged, relatively experienced, well educated, and riding larger bikes in comparison to the accident-involved riders.

The total number of questionnaires returned was 147. Owing to the distribution method, it is impossible to know exactly how many people actually saw the questionnaire so the proportion of questionnaires returned cannot be calculated; the response rate was nevertheless somewhat disappointing.

4.7.1 Personal details

The accident database shows that the vast majority of accidents involved male riders. Similarly, the majority of the questionnaire respondents were male (86.1%) rather than female (13.9%) (n = 144). The age of the riders is illustrated in Figure 11.

Figure 11: Bar graph comparing the age of the questionnaire respondents and the age of riders injured in motorcycle accidents



In Figure 11 the bar on the left indicates the age of riders involved in motorcycling accidents according to the motorcycle accident database. The bar on the right shows the age of the respondents to the questionnaire; it is obvious that the two groups are very different using this simple measure. The chart shows that the majority of accidents occur to younger riders; just under half (48%, n = 1,320) of all accidents involved riders under the age of 30 but only 8% (n = 141) of the respondents to the questionnaire were within that age band. As age increases actual accident rates fall quite dramatically, but the proportion of respondents to the questionnaire increases and remains higher than the actual accident involvement rate until the 60 or over age group. Most striking is the 40 to 49 age band who account for only 14% of all accidents but make up 42% of the respondents.

The motorcycle accident database does not hold information on ethnicity, qualifications or work experience, but these questions were included on the questionnaire because these categories might be relevant when looking at attitudes to motorcycling. Only six of the respondents to the questionnaire refused to supply information about their ethnicity and of those who did almost all described themselves as White (99%, n = 141). Just under half of the total number of respondents (47%) supplied information about their education and of these 71% were educated to degree level or above. It is possible (but by no means a given) that many of the blank responses were from respondents who perhaps did not have many or any qualifications and may not have wanted to admit to it. The majority of respondents supplied occupational details but these were far too varied to draw any meaningful conclusions.

4.7.2 Experience and riding habits

All 147 respondents to the questionnaire indicated how long they had held a motorcycle licence and the type of licence they held. This information was also recorded for 250 of the accidents on the motorcycle accident database.
A comparison is shown in Figure 12.

Figure 12: Bar graph showing the length of time the questionnaire respondents and the riders involved in motorcycle accidents have held a licence

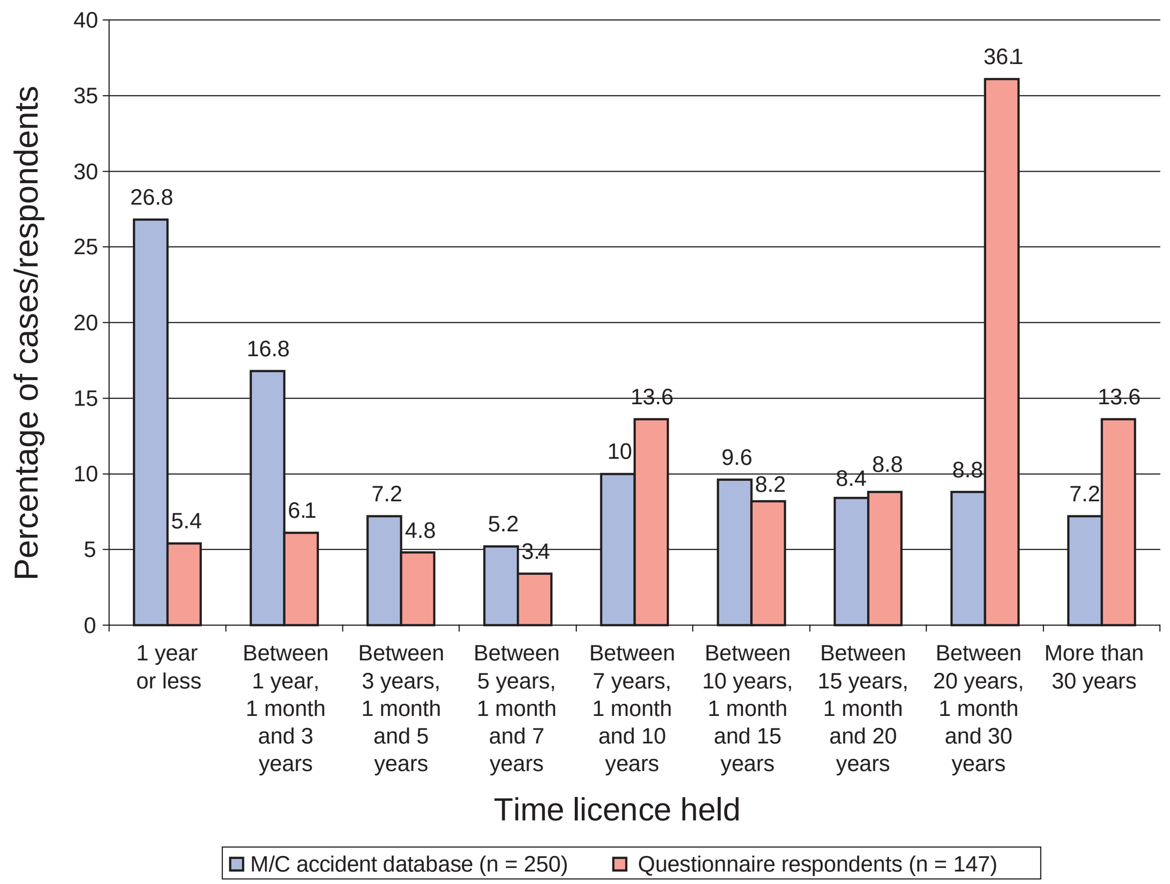


Figure 12 therefore shows that the questionnaire sample is not only older but is definitely more experienced than the accident-involved riders in the database.

The *types* of licenses were also considered. All but seven of the questionnaire respondents indicated they were holders of a full motorcycle licence, which was just over 95% of the total number. Of the riders whose details are held on the motorcycle accident database, 80% (n = 1,259) of the riders involved in an accident were holders of a full motorcycle licence with a further 13% (n = 1,259) being provisional licence holders. Just under 5% (n = 1,259) did not hold a licence of any description and should not have been using the motorcycle at the time that the accident occurred.

4.7.3 On-road experience

The questionnaire asked the respondents if they had any gaps in their motorcycling experience. 95% of the respondents to the questionnaire said they had started riding immediately after acquiring their licence but 43.8% (n = 146) of the respondents said there had been periods of time when they had not ridden. Of these, just over 40% (n = 66) had a gap of one year or less and 38% (n = 66) had a gap of three years or more.

The questionnaire responses indicated that the majority of respondents had ridden a wide range of motorcycles, with 36% (n = 118) stating they had ridden 'far too many to even attempt to list'! Understandably, the types of motorcycles ridden were wide ranging, but 38% (n = 147) indicated their main motorcycle was a sports bike whereas 26% (n = 147) said they would class their main motorcycle as a touring bike. Sports bikes and touring bikes typically have larger engine sizes and this is very much reflected in the engine sizes of the bikes ridden by the respondents, with 87.5% (n = 144) of the respondents to the questionnaire indicating that their main motorcycle was over 500cc in size.

Only 12.5% (n = 144) of the respondents rode motorcycles under 500cc but the motorcycle accident database has shown that 55% (n = 1,266) of the accidents involved riders using motorcycles of 500cc or less, with just under 40% (n = 1,266) involving motorcycles of 125cc or less. Only 3.5% (n = 144) of the questionnaire respondents rode a motorcycle of 125cc or less.

Finally, it is important to mention that the questionnaire respondents appeared to be very experienced road users. The majority (63.3%, n = 147) of the riders rode in excess of 5,000 miles per year and all but four of the respondents were regular users of other vehicles.

4.7.4 Reasons for using a motorcycle

Almost all of the respondents used their motorcycles for a wide variety of reasons. Interestingly, almost all of the questionnaire respondents (97.2%, n = 144) said they used their motorcycles for leisure trips, and a look at the purposes for using motorcycles when actual accidents occur using the motorcycle accident database reveals that riding for pleasure was the most common purpose of use when an accident occurs, although this information was only available for about 13% of the accidents on the database. 46.4% of the accidents (for which data were available) involved a rider riding for pleasure, whereas 25.4% occurred while riders were commuting and 14% occurred when the motorcycle was in use for work purposes.

4.7.5 Training

Table 5 shows the types of tests and training undertaken by the questionnaire respondents.

Table 5: Types of training and tests undertaken by the questionnaire respondents

Test/training	Percentage of respondents (n = 143)
Old-style motorcycle test	60.0
CBT (compulsory basic training)	39.2
Test on m/c over 120cc but under 125cc	23.8
Advanced rider training	17.5
Direct access test	12.6

It is clear that the majority of respondents (60%) have not had the level of training offered today, having undertaken the old-style motorcycle test before the introduction of compulsory basic training. The training undertaken was not detailed on the motorcycle accident database and so a comparison could not be made.

4.7.6 Riding habits

Riders were encouraged to comment on their riding habits in question number 13 of the questionnaire (a copy of which is in the appendix of this report). The first two sections of question 13 concerned visibility. Daytime headlight use was fairly common, with over 60% (n = 143) of the respondents always or frequently opting to use lights. The use of bright and/or reflective clothing was, however, less common. Just 14% (n = 143) of the respondents always or frequently chose to wear such items of clothing. Unfortunately, these details were often not recorded in police files used for the accident database so a direct comparison to actual accidents could not be made.

The use of protective clothing was considered next. Protective jackets were always worn by 81% (n = 145) of the respondents and a further 13% frequently wore one. Protective trousers were worn less but even so 69% (n = 145) of the respondents still said they always or frequently wore them.

Only 7.6% (n = 144) of the respondents said they regularly drove their motorcycle while they considered themselves to be tired and a quarter of the respondents claimed they 'never' drove while feeling tired. Unsurprisingly then, tiredness was a known factor in only four of the accidents on the motorcycle accident database. Similarly, 84.7% (n = 144) of the respondents claimed they never rode 'under the influence of alcohol or drugs', with the remaining respondents only admitting to have occasionally done so. Excess alcohol was found to be a contributory factor in just 3.4% of all accidents on the motorcycle database.

Speeding was found to be common among the respondents, with 58% (n = 143) admitting to always, or frequently, breaking the speed limit. The remaining respondents admitted to 'occasionally' breaking the speed limit but only when they thought it was safe to do so. Travelling in excess of the speed limit was considered to be a contributory factor in just 3.5% accidents on the motorcycle accident database. Of these, 62% were a result of the motorcyclist speeding. Misjudging the appropriate speed for conditions, however, accounted for a further 5.6% of accidents where the speed limit itself was not broken. Speeding, whether in excess of the speed limit or travelling too fast for the conditions, was therefore a factor in a total of 9.2% of accidents on the motorcycle accident database.

The respondents also admitted to frequently speeding while overtaking other road users, with 38.6% (n = 145) of the respondents claiming to regularly pass vehicles travelling 'at or above the speed limit'. Only 9.7% of the respondents claimed to never pass a vehicle travelling at or above the speed limit. Just under half of the respondents regularly passed two or more vehicles at the same time while overtaking, with only 3.4% (n = 145) of the respondents claiming never to have done this. Overtaking accidents only account for a total of 6.6% of motorcycle accidents held on the motorcycle accident database and only a quarter of these were the fault of the rider.

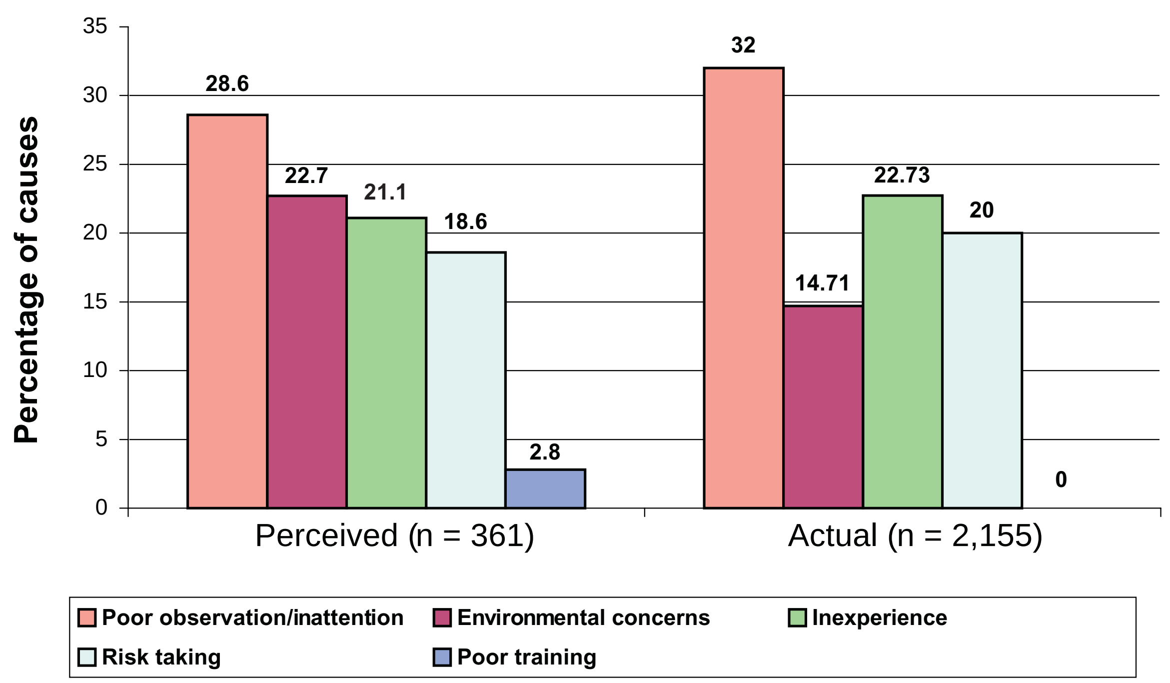
The 'lifesaver glance' is the last glance over his or her shoulder that a motorcyclist makes before carrying out a manoeuvre, especially a turn in the road as a last check that their path is clear. Only 40.3% (n = 144) of the respondents claimed to always use this but a further 43.1% (n = 144) claim to frequently use it.

The motorcycle accident database has shown that the most common cause of *single vehicle* accidents is a result of riders misjudging the appropriate speed to negotiate a bend in the road. A question was therefore included on the questionnaire asking the respondents how often, if ever, they have misjudged the speed required to negotiate a bend. Even though 69% of respondents appeared to be very experienced, they admitted to occasionally miscalculating bends. There were over 200 accidents on the motorcycle accident database that were a direct result of a rider losing control on a bend and, although the reasons for losing control were often unknown or not recorded, it is known that inappropriate speed was the main cause of 27.5% of the accidents.

4.7.7 *Views and opinions regarding causes of motorcycle accidents*

A total of 141 respondents to the questionnaire listed what they considered to be the three main causes of motorcycle accidents. Altogether 361 responses led to a list of 35 causes. These causes were easily broken down into five broad categories that focussed on poor observation and inattention, environmental concerns, inexperience, risk taking and poor training. A direct comparison of perceived and actual causes of motorcycle accidents (as revealed by the accident database) can therefore be shown in Figure 13. Figures for the 'actual' number of causes use a total number of 2,155 causes entered into the database at the time of analysis.

Figure 13: Bar graph showing the perceived and actual causes of motorcycle accidents



Poor observation and/or inattention were the most common cause of motorcycle accidents given by the respondents to the questionnaire as well as being the most common actual cause as shown on the motorcycle accident database. The questionnaire respondents clearly stated that it was not poor observation on the part of the motorcyclist but specifically on the part of other road users, with a massive 43% (n = 141) of the respondents saying that one of the main causes of motorcycle accidents was 'other road users failing to see riders'.

An examination of who is actually responsible for motorcycle accidents involving poor observation or inattention reveals that the rider is only responsible for 4.27% (n = 2,155) of the total number of causes given on the database, whereas another road user is responsible for almost a quarter (23.4%, n = 2,155).

The specific behaviours of other drivers given by the respondents included motorists' inattention, motorists changing lanes without looking properly, and motorists being distracted while in their vehicles by passengers, mobile phones, etc. 'No continuity of observation' was *the* biggest cause of accidents in the database; that reason alone being the cause of over a third of all motorcycle accidents. Of these, the riders were only at fault in 10.9% of the accidents, whereas the other road users accounted for 77.1%.

Environmental problems were a major concern for the questionnaire respondents and poor road surfaces were thought to be the biggest threat to the riders, 32.6% (n = 141) of the respondents claiming that poorly maintained roads were one of the main causes of motorcycle accidents. Slippery road surfaces were also mentioned by 17% (n = 141) of the respondents. Slippery road surfaces could be a result of not only wet or icy weather but also spillages on the road, such as oil and diesel. Of the causes listed on the motorcycle accident database, 14.7% (n = 2,155) involved such environmental concerns.

The questionnaire respondents gave inexperience as the third major cause of motorcycling accidents and, with the exception of only one response, it was the rider who was seen to be at fault.

Of the causes listed on the motorcycle accident database, 22.7% (n = 2,155) of the causes listed could be attributed to inexperience. There was, however, more of a split in terms of responsibility, with 7.51% (n = 2,155) of all accident causes listed being the fault of the rider's inexperience and a further 5.1% (n = 2,155) being the fault of the other road user's inexperience.

The fourth major cause of accidents was, perhaps surprisingly, seen by the questionnaire respondents as being the fault of the motorcyclists as opposed to other road users, and concerned accidents that were a result of deliberate risk taking by the riders. 14.7% of the responses (n = 361) referred to causes that were a result of deliberate risk taking, with just under a tenth of the respondents (9.9%, n = 141) simply stating that it was riders taking unnecessary risks that caused motorcycle accidents. A quarter of all respondents (25.5%, n = 141) said that riding bikes 'too fast for conditions' was a major cause of accidents. The emphasis was placed on riding too fast *for conditions* and not necessarily breaking the speed limit.

Risk taking was found to account for 20.8% of the causes listed on the motorcycle accident database, and of these causes 12.9% were a result of the motorcyclist taking risks and 4.69% were a result of other road users taking risks. Sub-categories included within this category included all actions that could be seen as putting the rider or other road users at risk, including travelling at inappropriate speed for conditions, driving recklessly, driving while tired or under the influence of alcohol, disobeying road signals, and specific manoeuvres such as overtaking in inappropriate situations or close following.

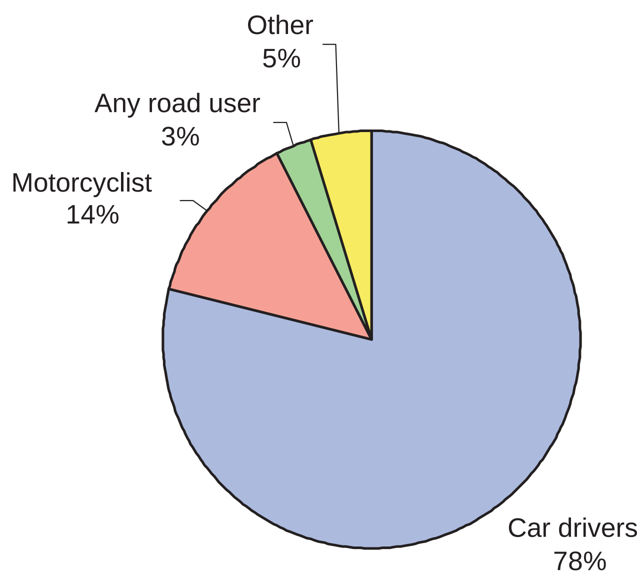
The remaining causes of accidents mentioned by just 10 of the respondents referred to training issues, four of whom claimed that poor motorcycle training for the riders themselves was to blame, and six of whom said it was poor training for other road users with regard to motorcycling issues.

The remaining causes listed on the motorcycle accident database accounted for only a small number of accidents and referred to mechanical problems (with the bike and traffic signals), which accounted for 2.3% of accidents, and the well-being of the rider, with 0.6% of accidents being a result of the rider being taken ill while riding.

4.7.8 *Who is responsible for motorcycle accidents?*

Figure 14 shows which category of road user the questionnaire respondents thought were the main cause of motorcycle accidents.

Figure 14: Pie chart showing the category of road users the questionnaire respondents thought were most likely to cause a motorcycle accident



All but one of the respondents answered this question and, as can be seen in Figure 14, just under 80% of the respondents thought that car drivers were primarily to blame for accidents involving motorcycles. Cyclists, large commercial vehicles, pedestrians and animals in the road were each only mentioned once.

The motorcycle accident database recorded who was to blame for the 1,790 accidents, splitting the accidents into five main categories. Rider 1 was the motorcyclist involved in the accident. Driver 2 was the second vehicle involved in the accident. The third category was where a pedestrian was to blame. The remaining two categories were joint/combined blame and other/unknown. The split can be seen in Table 6.

Table 6: Primary blame for accidents on the motorcycle accident database

Primary blame	No. of accidents	% total (n = 1,790)
Rider 1	754	42.1
Driver 2	788	44.0
Pedestrian	35	1.9
Unclear/combined	165	9.2
Other/not known	48	2.7

Table 6 shows an even split of responsibility for accidents with driver 2 and rider 1 to blame in around 40% of the accidents, respectively. However, just under a third of accidents suffered by motorcyclists did not involve a second vehicle and if these are removed from the figures a slightly different picture emerges, as can be seen in Table 7.

Table 7: Primary blame for accidents on the motorcycle accident database after the removal of single vehicle accidents

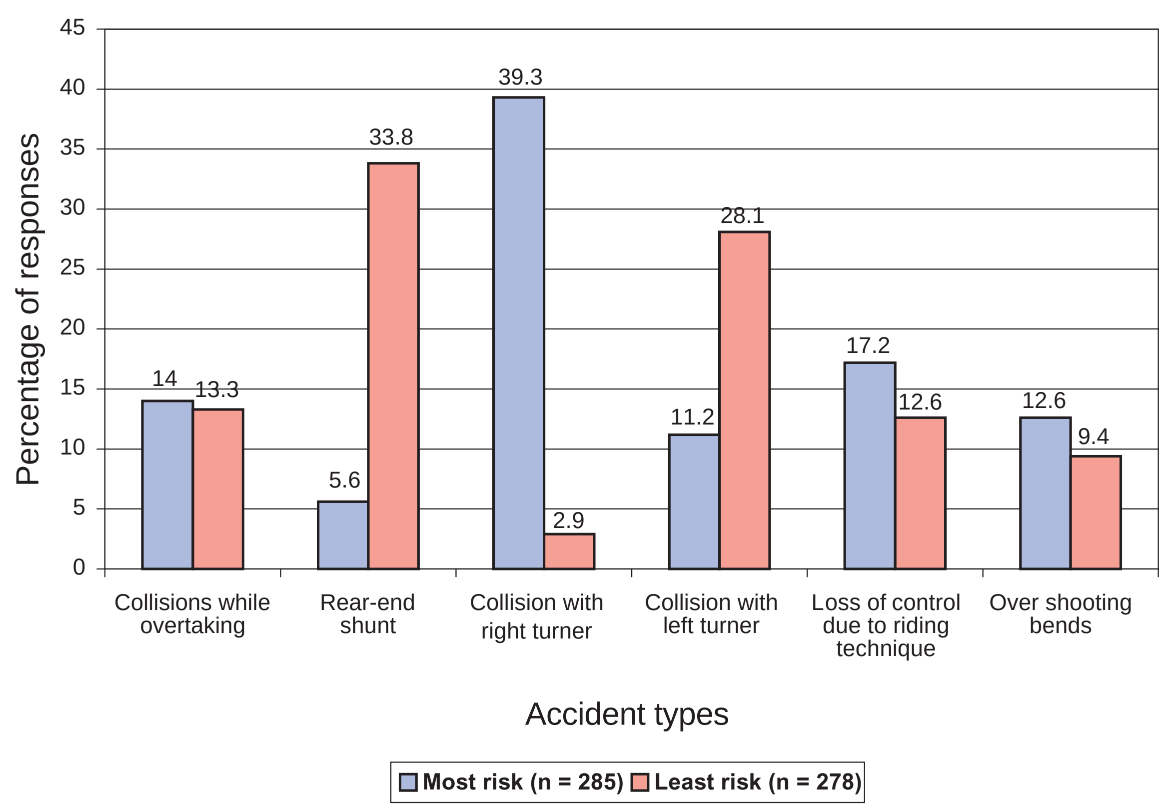
Primary blame	No. of accidents	% total (n = 1,228)
Rider 1	269	21.9
Driver 2	699	56.9
Pedestrian	4	0.3
Unclear/combined	144	11.72

Driver 2 is now clearly shown as responsible for over 50% of accidents involving two or more vehicles.

4.7.9 Accident types

Six types of accidents were listed and the respondents to the questionnaire were asked to choose the two they thought motorcyclists were most at risk from and the two they thought that motorcyclists were least at risk from. The results are shown in Figure 15.

Figure 15: Bar graph showing how at risk the questionnaire respondents thought they were from specific types of accidents



There appears to be a fairly even spread of opinion about the riskiness of some types of accidents. In the case of collisions while overtaking, loss of control and overshooting bends, similar proportions of respondents saw these accident types as ones in which riders were most at risk as those who saw them as least risky. However, respondents clearly saw riders as being especially vulnerable to collisions with right-turning vehicles and least at risk from being hit from behind by a vehicle (rear-end shunt). Collisions with left turners were not regarded by respondents as being a particularly risky manoeuvre.

When the respondents were asked to comment on which other accidents they thought motorcyclists were at risk from, a total of 90 respondents supplied answers. Again, answers were varied and many of the responses did not refer to specific accident types, referring, for example, to specific road users. Of those that did, however, 31.3% (n = 150) of the responses given referred, once again, to losing control on badly maintained or poor road surfaces.

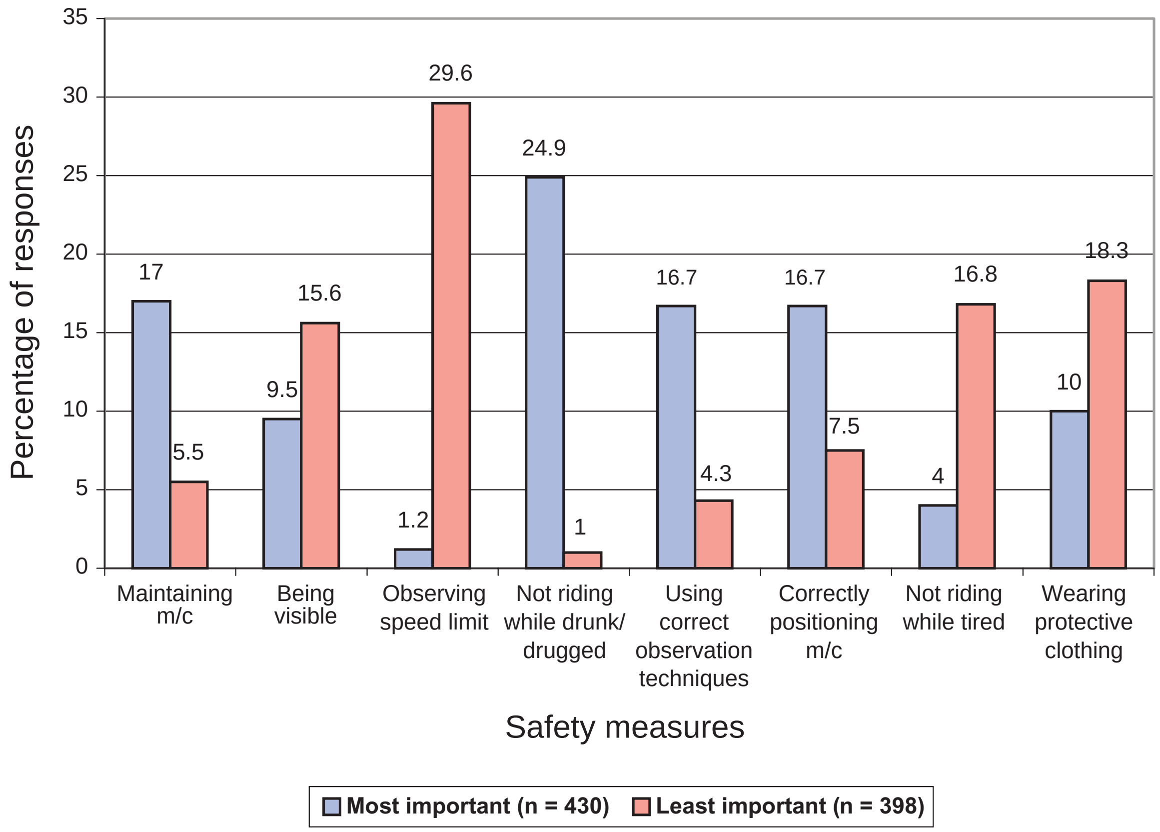
The motorcycle accident database split the accident types into six broad categories. The accident types are shown in Table 8 and account for a total of 1,416 accidents on the database.

Table 8: Accident types as given on the motorcycle accident database		
Accident type	**Frequency**	**% total (n = 1,790)**
L/hand bend lose control	127	7.1
R/hand bend lose control	97	5.4
Rear-end shunt	204	11.4
ROWV	681	38.0
Overtaking accidents	260	14.5
Pedestrian related accidents	47	2.6

4.7.10 Safety measures

Finally, a list of eight safety measures were given to the questionnaire respondents who were asked to choose the three they thought were most important and the three they thought were least important. The results are shown in Figure 16.

Figure 16: Bar graph showing safety measures considered to be important by the questionnaire respondents



In total 144 respondents answered this question. Perhaps most interesting are the choices made regarding which safety measures are least important for the respondents. Figure 16 clearly shows that the vast majority of respondents consider observing the speed limit as the least important safety concern; a total of 81.9% of respondents (n = 144) ticked this box on the questionnaire, indicating that they considered this to be of least importance. It was also somewhat surprising that using protective clothing and being visible were considered by so many respondents as least important. Unsurprisingly, the most important safety concern was not riding while under the influence of drink or drugs.

Safety measures were not considered by the motorcycle accident database, so a direct comparison cannot be made.

4.8 Countermeasures

Taking just the 'A' class (most detailed) cases, the next step was to consider any simple behavioural countermeasure which could have made a substantial difference to the outcome of each accident in turn, either by preventing it or reducing its severity. A list of 19 possible behavioural strategies for avoiding typical motorcycle accidents was drawn up using established texts, such as '*Roadcraft*' and *The Highway Code*, together with prior knowledge of the data. The countermeasures were concerned solely with simple rider/driver behaviours and did not extend to road/vehicle engineering factors which were outside the scope of this study. Each case was coded for the countermeasures that might have either prevented the accident or reduced the severity of it. Countermeasures were not meant to be either exotic or counter-intuitive, and they dealt with mainly obvious measures that would be understood by most competent riders/drivers. At the same time, they were meant to be of 'medium grain size', so as to apply across accident types to a certain extent, while at the same time not appearing too banal. Rules that can be applied across accident types also mean that accidents can be compared on their countermeasure profile. Table 9 shows the percentage of cases where each of the 19 countermeasures might have made a difference to the outcome of an accident, considered both from the point of view of the motorcyclist and other drivers or riders involved in the accident. Riders were also divided into two further groups above and below the age of 25. (A more detailed list of countermeasures can be found in the appendix of this report.)

Table 9: Effective countermeasures for accident-involved motorcyclists				
Countermeasure	**All motorcyclists**	**All other driver/riders**	**Riders <25 years**	**Riders 25 years +**
1 Vision	2.2	**25.4**	3.42	1.3
2 Stop at junction	1.3	**4.9**	1.28	1.3
3 Right re-check	–	4.8	–	–
4 Approaching traffic speed check	0.7	3.0	0.85	0.3
5 Speed check/junction	9.9	0.2	11.1	8.6
6 M/c position	5.8	–	5.13	6.0
7 Safe distance	8.8	3.7	**11.5**	7.3
8 Distraction	7.3	2.3	9.4	5.6
9 Look ahead	0.9	0.2	0.43	1.3
10 Speed for conditions	**19.0**	0.5	**20.5**	**17.9**
11 Speed for bend	**14.7**	0.9	**11.54**	**16.3**
12 Position on bend	3.2	0.2	2.5	2.0
13 Brake on bend	0.7	–	–	1.3
14 Mirrors and blind spot	0.6	**21.0**	0.85	0.3
15 Indication	0.6	4.0	0.43	0.7
16 Overtake at junction	**16.4**	1.1	**12.0**	**19.9**
17 White line cross	0.6	0.4	0.43	0.7
18 Filtering caution	7.3	0.2	6.8	7.6
19 Speed – overtakes	1.3	0.5	1.3	1.3

Figures indicate the percentage of all cases involving that type of driver/rider where one or more countermeasures were judged to have been applicable. Countermeasures are not mutually exclusive.

Figures 17 and 18 show how these countermeasures, considered *cumulatively*, could prevent large proportions of all motorcycle accidents. In the case of both motorcyclists themselves, and other involved drivers, the top two or three countermeasures can affect a large proportion of the accidents under consideration. Three simple countermeasures covered nearly 50% of the cases where it was felt that a rider could have done anything to avoid the accident, and two main countermeasures covered nearly the same proportion in the case of the behaviours of other drivers involved in motorcycle accidents.

Figure 17: Histogram showing the top three measures that could be taken by motorcyclists to alter the outcome or likelihood of an accident as a cumulative percentage of cases

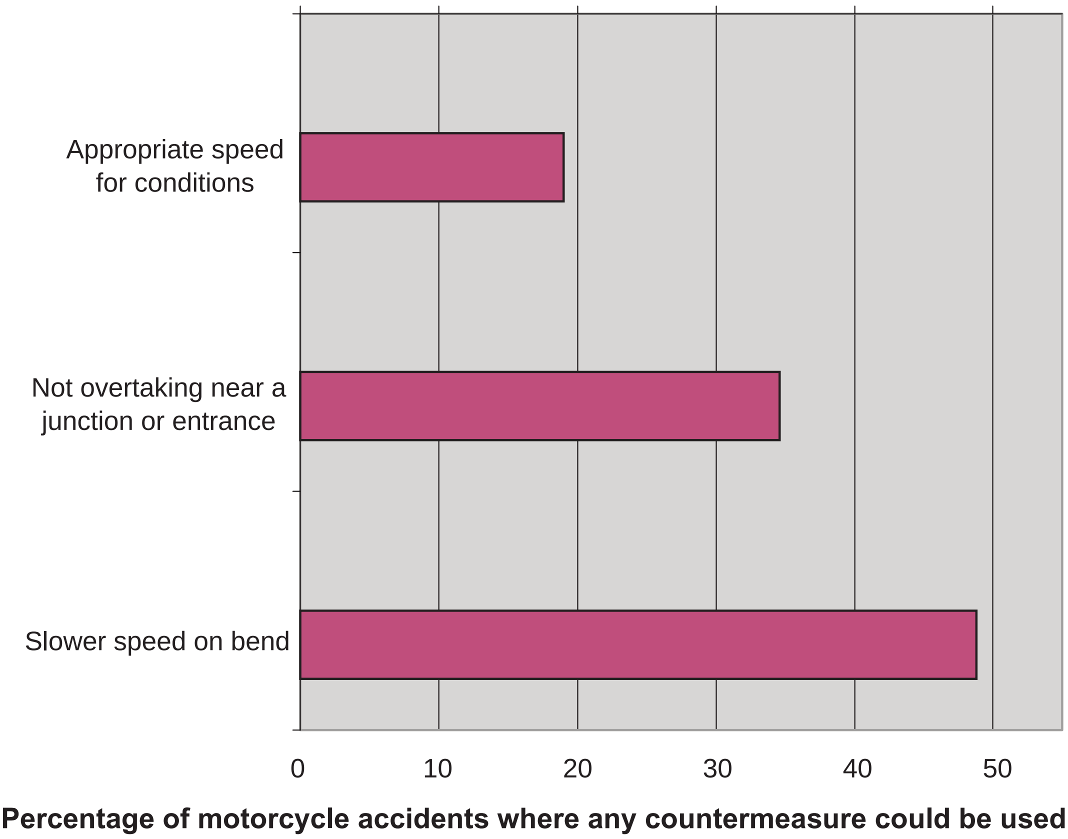


Figure 18: Histogram showing the top two measures that could be taken by other drivers to alter the outcome or likelihood of an accident as a cumulative percentage of cases

The over-riding message to motorcyclists is that they must slow down, not merely in relation to mandatory limits but also in consideration of various normal road hazards, particularly bends. In addition, they must avoid overtaking slower moving vehicles in the vicinity of junctions, even if the traffic is stationary and they are ‘filtering’ past it.

The over-riding message to other drivers is that they must look more carefully for approaching motorcycles at junctions of all types, and also make careful rear observations, including the use of side mirrors and blind-spot checks, before making many manoeuvres.

5 DISCUSSION

It is clear from this research that any initiatives in motorcycle safety should address the behaviours of both motorcycle riders *and* other road users. Overall, motorcyclists have been found to blame (or at least partly to blame) in around half of all the accidents they become involved in, so any countermeasures should be targeted equally at riders and other road users.

5.1 'Right of way' accidents

In ROWV accidents in particular, there is a marked problem with other road users seeing motorcyclists. It has been noted by researchers that, in a certain proportion of observation-failure cases of this type, the motorcycle that the driver had failed to see was so close to the junction that they had been negotiating that there appeared to be no explanation as to why they had not seen it, even when looking in that direction. This is commonly referred to as 'looked but did not see' (LBDNS) in the police co-factors used in this study, and in a review of work by Brown (2002), for example. If all such accidents were to be eliminated, our results suggest a theoretical fall of slightly over 25% in the total motorcycle accident rate.

It seems that one explanation for accidents such as these is that drivers in these circumstances 'overlook' the foreground while concentrating on the more distant view beyond the junction mouth. This might imply that Treisman's (1996) 'feature integration theory', suggesting that drivers might rapidly scan the traffic scene for a single feature of a potential hazard, such as proximity, and decide to proceed without noticing the approach of a more distant but rapidly approaching vehicle, is perhaps not applicable in these types of motorcycle accident. However, 'proximity' is not the only feature of a potential hazard that drivers might be concentrating on. Brown (2002) lists other factors, such as orientation, speed, size and shape, which drivers might be equally likely to settle on as single features in a rapid scanning task. The phenomenon whereby drivers overlook a motorcyclist in the immediate foreground seems to be in agreement with the work of Mack and Rock (1998), whose theory of 'inattentional blindness' showed that subjects may be *less* likely to perceive an object if they are looking at it directly than if it falls outside the centre of the visual field. Unfortunately, it is quite difficult to be more precise on this point and to quantify the distances involved from the information available, though we do have on record cases that suggest distances of 20 metres or less. Though the small frontal area of motorcycles might render them more likely to be obscured by for example, a car's windscreen pillar under certain circumstances, the information we have is likewise not detailed enough to say anything meaningful on this matter.

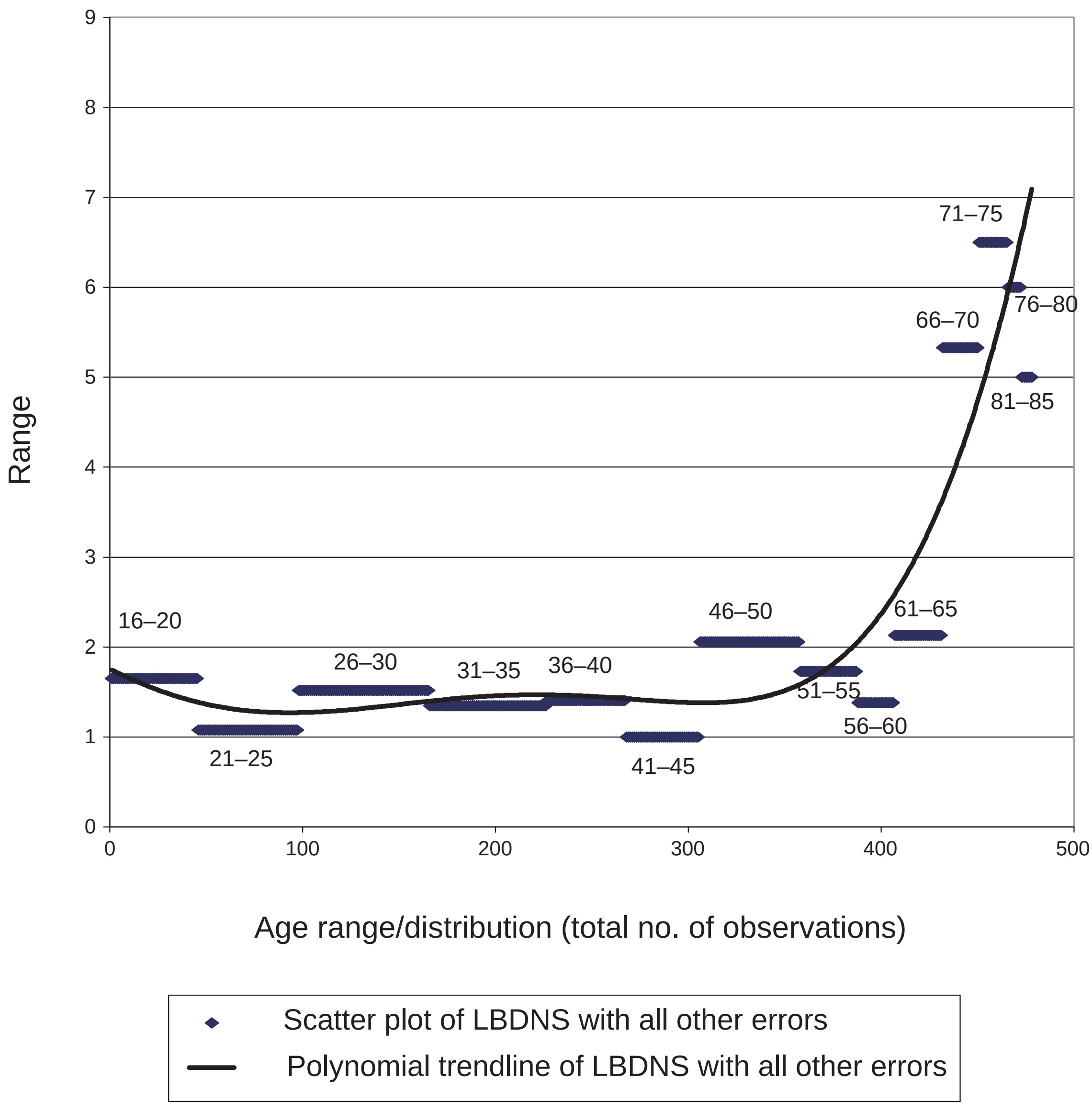
'Inattentional blindness' is suggested by research to be affected by four main factors: conspicuity, expectation, mental workload and capacity. Drivers' mental workload and capacity are somewhat beyond the remit of this study, but some results would seem to permit the discussion of conspicuity and expectation.

Over 30% of our detailed sample of ROWV accidents where a motorcyclist is not at fault involve a motorcyclist who is recorded as using daytime running lights or reflective clothing, or both. It is likely that this figure is an underestimation, given that this information is not always recorded by police reliably. Reeder et al. (1996) reported that the use of headlights in the daytime was found to be much more common, especially when compared with reflective clothing use, some of which was found to be unacceptable to some users. The work of Hole and Langham (1996) suggested that it might be unwise to concentrate on the traditional advice to motorcyclists to make themselves more conspicuous. Research into motorcycle conspicuity has produced mixed results, e.g. Yuan (2000), and Hole and Langham have suggested that *driver expectation*, which is particularly seen in more experienced drivers in their research, is the main reason behind many drivers' failure to see an approaching motorcycle. The fact that many motorcyclists in our sample appear to be trying to make themselves more conspicuous but are not seen, nevertheless lends credence to the idea that there is something amiss in the cognitive processes of the other involved driver.

The 'expectation' factor, in particular, raises the possibility that some road users have a poor perceptual 'schema' for motorcycles in the traffic scene, and therefore do not process the information fast enough when motorcyclists are observed. It is, however, difficult to prove this hypothesis, although Duncan's (1996) 'integrated competition hypothesis', which suggests that attention to some kinds of object in road traffic scenes may be inhibited as drivers concentrate on features of the traffic scene which *their experience* has shown to be of critical importance, might indeed provide some explanation of this phenomenon. Simons' (2000) work on inattentional blindness conditions led him to believe that 'drivers often do not see salient and important objects. This fact can be rephrased in terms of attentional capture: if observers are attending to their driving (e.g. the car in front of them, road signs, etc.), and if they do not *expect* pedestrians to step in front of the car, they are unlikely to see them'; a conclusion that could equally well be drawn in the case of motorcyclists rather than pedestrians. Green (2002) comments: 'It is one of the ironies of inattentional blindness that highly skilled and highly practiced "experts" are more susceptible than are beginners. In fact, when we say someone is skilled and experienced, we usually mean that he has developed expectations which allow fast and accurate prediction and behaviour.' If this was so, it would be expected that drivers at fault in ROWV accidents involving motorcyclists as innocent parties might be, on average, older than an equivalent group of drivers at fault in non-ROWV accidents with motorcyclists. Our research shows this to be the case; the average age of drivers in 'at fault' ROWV accidents involving motorcycles, 41 years, is significantly higher than the equivalent group in non-ROWV accidents, 36 years ($t = 3.45$, $p < 0.05$). Green has referred to this phenomenon somewhat bleakly as 'the cost of being an expert'. Unfortunately, we have no further information on the experience level of these older accident-involved drivers, though their mean age (41.2 years) would suggest a correspondingly high level of experience.

For right of way accidents that involve other drivers pulling out in front of motorcyclists who are perhaps further away, it could also be that more global visual failings are contributing to the age effect outlined in the previous paragraph and detailed in Figure 19. When ratios of LBDNS accidents against other non-ROWV ‘at fault’ accidents for involved drivers in the sample are examined, it can be seen that the proportion of this visual error compared with other ‘at fault’ errors rises with age. The change in ratio occurs at too greater an age (65 years plus) to be related purely to driver skill factors, and suggests an age-related deficit. The scatter-plot in Figure 19 shows this, but ratio plots comparing LBDNS with other types of visual and non-visual error that have been produced from the data do not show any significant rise with age.

Figure 19: Scatter plot of ratios of driver 2 at fault in LBDNS /all other errors



The reasons for such an increase in global visual failings with age are many. Isler et al. (1997) found, in an analysis of the effect of reduced head movement and other deteriorations in the visual system on the useful field of view for the drivers aged 60 years plus, there was an evident restriction on the distances at which approaching traffic could be brought into the central, stationary field, so that even at maximum head rotation plus one saccadic eye movement, approaching vehicles would not be clearly perceived beyond a distance of 50 metres. Isler et al. also point out the large numbers of visual deficits, such as scotoma, that occur naturally with aging, and which may not be appreciated by the driver due to their gradual onset. Figure 19 appears to show some evidence of increasing global visual failures with age. Drivers with 'at fault' accidents that might be said to have less of a visual search component (or, at least, a very different search component), such as overtaking accidents, have not been found to show the same general increase with age in our analysis.

To conclude on ROWV accidents, two possible explanations exist for 'looked but did not see' accidents involving motorcycles, both of which would appear to affect older drivers more than younger ones. This is an area of potential concern due to aging population demographics throughout the UK and the European Union. In any case, past safety campaigns that put the emphasis on other drivers to be more vigilant regarding motorcycles (e.g. 'Think Bike') would seem as relevant as ever.

5.2 Bend accidents

Bend accidents are a particular area of concern as our analysis shows that they are over twice as likely to cause a rider or pillion's death when compared with the sample as a whole, and over one and a half times more likely to cause serious injuries. The high proportion of motorcycle accidents that involve going out of control on a bend are in line with findings reported by the Royal Society for the Prevention of Accidents (RoSPA) (2001). This seems to be linked with more than one type of inexperience. Young riders with no licence, or only a provisional licence, seem to lack the skills needed, and take more risks, which contributes to their increased likelihood of this type of accident.

In contrast there is some evidence that an older 'born again biker' subgroup seem to be mismatching the performance of new machines with their own previously learned abilities. If motorcycle category is examined, it is shown that over 40% of 'super-sport' bike riders at fault in the sample come to grief on bends. This is over twice the proportion of 'at fault' bend accidents found in all other types of machine, and 'super-sport' bikes are over-represented in 'at fault' bend accidents relative to their numbers in the sample as a whole. Riders in this category are more likely than others to be travelling at speed (whether over the speed limit or at speeds inappropriate to road conditions), riding for leisure purposes, and riding in groups with other riders. Moss (2000), in his report on rural motorcycle accidents, was more specific regarding the type of behaviours these riders are exhibiting, saying that '. . . riders are failing to ride their machines within their personal capabilities even though the bike itself may have been well within its performance envelope at the time of the crash. . .riders had either braked or shut their throttles mid-bend, resulting in understeer crashes'.

Possible solutions to at least one of these forms of inexperience-based bend accident may include more advanced rider training in such areas as the use of so-called 'countersteering'. A skill that has only become widely recognised relatively recently, countersteering is the technique of using gyroscopic precession to cause the motorcycle to change direction quickly and accurately. However, skill-based interventions in training have a somewhat mixed track record. The increased use of skid-pan training for young Swedish drivers did not cause their accident rate to drop, but was shown to have given them a false level of confidence about driving on icy roads, for example (Gregersen, 1996). Similarly, an 'assessed riding' course offered by Bikesafe in Scotland (Ormston et al., 2003) found that motorcyclists' reported speeds fell in urban areas after the completion of the course but *rose* in rural areas (where most serious and fatal bend accidents occur), possibly as a result of rider overconfidence post-course.

5.3 Motorcycle manoeuvrability accidents

The high speed, acceleration and manoeuvrability of motorcycles cause further accident risk. Riders, particularly younger riders on high-capacity machines, can be presented with overtaking opportunities that they find hard to resist (as with the riders investigated by Mannering and Grodsky, 1995). Riders of 'super-sport' classed motorcycles who are aged under 25 have approximately a third more overtaking accidents in which they are at fault than do riders of similar machines who are over 25 years of age.

In contrast, other drivers on the road often fail to take account of the fact that much smaller vehicles can overtake or pass their own where cars or lorries might not be able to. Accordingly, they completely fail to take into account the possible approach of motorcyclists and thus further contribute to the risk of an accident. Drivers need to be made more aware that motorcycles can be approaching from (to them, at least) unexpected directions, perhaps through advertising campaigns such as the recent 'Now You See Him, Now You Don't' advert, part of the DfT's 'THINK!' campaign.

5.4 Other motorcycle accidents

In the case of rear-end shunts in particular, it was observed that riders at fault in this kind of accident were far more likely to be young, relatively inexperienced riders on small engine capacity scooters and mopeds. This is perhaps surprising, given that inexperienced riders of large sport bikes, with their much higher speed capabilities, should in theory be running into the rear of stationary traffic to an equal or greater extent. It seems that a large number of young riders of mopeds and scooters come to grief on wet and/or otherwise slippery roads; over half of the rear-end shunts occur in such a fashion. It could be that this is a skill failure on their part as it is typically much harder to bring a light machine with separate front and rear brakes to a controlled stop when compared with a heavier four-wheeled vehicle. Though there is always instruction on emergency braking in basic training, it is not clear that this is enough. This is an issue of concern as rear-end shunts can still result in far more serious injuries and fatalities than the same kind of accident in a car.

5.5 Riders' attitudes

There were many causes of motorcycle accidents given on the motorcycle accident database that involved an element of risk taking. The questionnaire respondents, however, mentioned just four broad categories and it was risk taking on the part of the riders rather than the other road users that was seen to be a problem by the questionnaire respondents.

The most interesting finding was that a quarter of the respondents (25.5%, n = 141) thought a major cause of motorcycle accidents was riders riding *too fast for conditions*. Despite this, however, 58% (n = 143) of the respondents admitted to always or frequently breaking the speed limit, with the remaining occasionally doing so. The riders therefore made a clear distinction between *breaking the speed limit* and driving at inappropriate speeds that are *too fast for conditions* (but not necessarily breaking the speed limit). One of the respondents to the questionnaire who wished to remain anonymous attached a letter to their questionnaire that summarised the feelings of many of riders:

> *'I find that the speed limits set are often completely inappropriate depending on the circumstances... I would consider riding at 30 mph past a school when the children are leaving as being far too fast but on the other hand what possible danger could result from travelling along an open stretch of motorway at 11pm at night without another vehicle in sight at 80 or even 90mph?'*

An examination of the causes on the motorcycle accident database would seem to indicate that the respondents may have a point, as travelling in *excess of the speed limit* was only a causation factor in a minority of accidents on the accident database, though travelling at inappropriate speeds *too fast for conditions* accounted for a greater number of accidents. The figures would suggest therefore that the riders are correct in making this distinction. The lack of importance the riders gave to observing the speed limit was also shown by the safety measures given by the respondents to the questionnaire. A total of 117 respondents to the questionnaire (79.6%, n = 147) considered *observing the speed limit* as being one of the *least important* safety measures a motorcyclist can take.

The next most cited cause of motorcycle accidents in this category involved riders taking unnecessary risks. The questionnaire respondents mentioned no specific risks but there were a large number of risks on the motorcycle accident database that would easily fall into this category. These included deliberate close following, risky overtaking manoeuvres, ignoring road signals or signs, and driving or riding while under the influence of alcohol or when tired.

Alcohol-related accidents were given a prominence in the literature but were found to be rare. The study has shown that alcohol was only a factor in a total of 3.4% of accidents in the database. Unsurprisingly, the majority of questionnaire respondents claimed that they never rode over the limit (84.7%, n = 143), and not riding while under the influence of alcohol was seen as one of the most important safety measures a rider can take by 72.8% (n = 147) of the respondents to the questionnaire. This could be an indication of the social stigma now attached to drink driving or riding.

Overtaking in risky situations was a further cause for concern and overtaking accidents accounted for 260 out of the 1,790 on the motorcycle accident database. The questionnaire respondents admitted to regularly passing vehicles, sometimes two or more at the same time, and it is reasonable to assume that motorcyclists have the opportunity to pass other vehicles more often than drivers of other vehicles due to the size and power of their machines. Despite this, only a quarter of the overtaking accidents where blame was known were the fault of the motorcyclist, which would indicate that riders have a good knowledge of the risks associated with overtaking.

The remaining two broad areas of concern given by the questionnaire respondents were riders riding beyond an individual's ability, a reason given by 9.9% (n = 141) of the respondents, and accidents that have been a result of aggressive driving, 2.1% (n = 141).

Finally, it is important to note that the literature suggests that age is *the* most important factor in risk taking. Rutter and Quine (1996) and Keskinen et al. (1998) both emphasised the importance of age over actual experience, stating that young riders are far more likely to be involved in motorcycle accidents. This research appears to support this, as the motorcycle accident database shows a steady reduction in the numbers of accidents as the age of the riders involved increases from 35 years of age upwards. Rutter and Quine (1996) stressed the importance of making young riders aware of the consequences of dangerous riding. The evidence presented here indicates that a further study focussing exclusively on the attitudes and beliefs of younger riders should be beneficial in helping to understand why this age group is so at risk or prone to risk taking. Actively alerting young people to the dangers of road use would certainly seem like a logical step.

A final area to be considered (and mostly ignored by the police officers in their accident reports and consequently the motorcycle accident database) were the measures taken by the riders to protect themselves in the event of an accident occurring. It was very encouraging that just under 80% of these respondents (79.3%, n = 145) wore ‘approved’ type A helmets, which offer the most protection in an accident. As these helmets are typically more expensive than the ‘approved’ type B helmets, this clearly shows the value that the questionnaire respondents give to having a good quality helmet. Protective jackets were worn by nearly all riders who responded to the questionnaire and the majority of respondents also reported wearing protective trousers ‘always’ or ‘frequently’ when riding (69%, n = 145).

The majority of respondents to this questionnaire do therefore appear to not only have an understanding of the protective clothing they should be wearing but, in most cases, make a great deal of effort to do so, which, in the event of an accident occurring, almost always helps to reduce the severity of injuries suffered by the riders.

6 CONCLUSIONS

According to RoSPA (2001), between 1998 and 1999 the number of motorcyclists killed or seriously injured on British roads seemed to increase after a period of general decline, perhaps owing to a recent rise in motorcycle traffic over the same period. Recent increases in registered two-wheelers of all kinds and further increases in motorcycle traffic for the period 2001–2002 (DfT statistics, 2003), mean that this problem could get even worse.

The main conclusions of our research are as follows:

- A way must be found of targeting the other parties who so frequently cause motorcycle collisions. Drivers have to be made aware of the numerous ways that they can fail to perceive a motorcycle in the typical ROWV accidents that are most frequently not the fault of the rider involved. Our results suggest that interventions should be focussed on (but not exclusively confined to) older drivers.
- Specific behaviours of motorcyclists themselves also need addressing. Rider *skills*, while seeming proficient in certain areas were also found to be lacking in others. Attention should be paid to the cornering techniques of riders in particular; the ability of riders to plan ahead; and the importance of riding within an individual's ability.
- Training initiatives, such as 'Bikesafe' in Scotland, described by Ormston et al. (2003), have reportedly had some success in using 'assessed ride' techniques to teach vulnerable motorcyclist groups more defensive riding techniques. However, while this leads to an apparently favourable adoption of lower speeds in built-up areas, it can increase motorcyclists' confidence and thus their likelihood of adopting faster speeds in rural areas. As a large proportion of serious and fatal accidents happen in rural areas, it is far from clear that increasing motorcyclists' confidence in this area would be productive.
- An approach is therefore clearly needed that targets riders' *attitudes* to risk, as well as the effective measures that can be taken in the area of defensive riding skills. The results of this study suggest that, as far as motorcyclists' specific problems are concerned, there are two main groups of riders that should be concentrated on using such an approach. The first is young and inexperienced riders of smaller capacity machines, such as scooters (which experienced a sales increase of 16% in 2003); and the second is older, more experienced riders of higher capacity machines (which now account for around half of all motorcycles registered today), who still come to grief even though they are relatively experienced road users.
- The questionnaire revealed that older and more experienced riders tended to be quite aware of the risks of motorcycling and, with the possible exception of

speeding, exhibited attitudes consistent with riding safely. However, a way must be found of getting the safety message to younger, more inexperienced riders. Our previous research (Clarke et al., 2002) has shown that younger road users tend to show more 'attitudinal' failings than skill failures in their accidents, and this also seems to occur in the younger motorcyclists in this study. More research into the failings of younger riders in particular may prove valuable.

7 REFERENCES

Brown, I.D. (2002) A review of the ‘look but failed to see’ accident causation factor. In *Behavioural Research in Road Safety XI.* London: Department for Transport, Local Government and the Regions.

Chesham, D.J., Rutter, D.R. and Quine, L. (1993) Motorcycling safety research: A review of the social and behavioural literature. *Social Science and Medicine*, 37 (3), 419−429.

Clarke, D.D., Ward, P. J. and Truman, W. A. (2002) *Novice drivers’ accident mechanisms: Sequences and countermeasures*. http://www.roads.dtlr.gov.uk/roadsafety/behaviour/14.htm

Clarke, D.D., Forsyth, R.S. and Wright, R.L. (1998a) Junction road accidents during cross-flow turns: a sequence analysis of police case files. *Accident Analysis and Prevention*, 31 (1−2), 512−526.

Clarke, D.D., Ward, P. and Jones, J. (1998b) Overtaking Road Accidents: differences in manoeuvre as a function of driver age. *Accident Analysis and Prevention*, 30 (4), 445−467.

Colgan, P.W. and Smith, T.J. (1978) Multidimensional contingency table analysis. In: Colgan, P.W. (ed.), *Quantitative Ethology*, pp. 146–174. Wiley, New York.

Department for Transport (2003) *Transport Statistics*. http://www.dft.gov.uk/stellent/groups/dft_transstats/documents/sectionhomepage/dft_transstats_page.hcsp

Department of Environment, Transport and the Regions (DETR) (2000) *Tomorrow’s Roads − Safer for Everyone*: *The Government’s road safety strategy and casualty reduction targets for 2010*. DETR report. London: HMSO.

Duncan, J. (1996) Converging levels of analysis in the cognitive neuroscience of visual attention. In G.W. Humphreys, J. Duncan and A. Treisman (eds) *Attention, Space and Action*: *Studies in Cognitive Neuroscience*. Oxford: OUP, 112−129.

England, L. (1981) The Role of Accident Investigation in Road Safety. *Ergonomics,* 24 (6), 409−422.

Everett, S.A., Shults, R.A., Barrios, L.C., Sacks, J.J., Lowry, R. and Oeltmann, J. (2001) Trends and subgroup differences in transportation related injury risk and safety behaviours among high school students, 1991−1997. *Journal of Adolescent Health*, 28, 228−234.

Fell, J.C. (1976) A Motor Vehicle Accident Causal System: The Human Element. *Human Factors*, 18 (1), 85−94

Grayson, G. and Hakkert, A. (1987) Accident analysis and conflict behaviour. In J. Rothengatter and R. de Bruin (eds) *Road Users and Traffic Safety.* Assen, Netherlands: Van Gorcum.

Green, M. (2002) Inattentional Blindness. *Occupational Health & Safety Canada* (Jan./Feb. issue), 23–29.

Gregersen, N.P. (1996) Young drivers' overestimation of their own skill – an experiment on the relation between training strategy and skill. *Accident Analysis and Prevention*, 28, 243–250.

Hayakawa, H., Fischbeck, P.S. and Fischhoff, B. (2000) Traffic accident statistics and risk perceptions in Japan and the United States. *Accident Analysis and Prevention*, 32, 827–835.

Hole, G.J., Tyrell, L. and Langham, M. (1996) Some factors affecting motorcyclists' conspicuity. *Ergonomics*, 39(7), 946–965.

Hurt, H.H., Ouellet, J.V. and Thom, D.R. (1981) *Motorcycle Accident Cause Factors and Identification of Countermeasures, Volume 1: Technical Report*. Traffic Safety Center, University of Southern California, Los Angeles, California 90007, Contract No. DOT HS-5-01160.

Isler, R.B., Parsonson, B.S. and Hansson, G.J. (1997) Age Related Effects of Restrictive Head Movements on the Useful Field of View of Drivers. *Accident Analysis and Prevention*, 29 (6), 793–801.

Keskinen, E., Ota, H. and Katila, A. (1998) Older drivers fail at intersections: speed discrepancies between older and younger male drivers. *Accident Analysis and Prevention*, 30 (3), 323–330.

Kopjar, B. (1999). Moped injuries among adolescents – a significant forgotten problem? *Accident Analysis and Prevention*, 31 (5), 473–478

Mack, A. and Rock, I. (1998) *Inattention Blindness*. Cambridge, MA: MIT Press.

Malaterre, G. (1990) Error analysis and in-depth accident studies. *Ergonomics,* 33, 1403–1421.

Mannering, F.L. and Grodsky, L.L. (1995) Statistical Analysis of Motorcyclists' Perceived Accident Risk. *Accident Analysis and Prevention*, 27(1), 21–31.

Moss, J. (2000) Rural Leisure Motorcycling – Addressing Accidents. Cheshire County Council Road Safety Section, unpublished report. Published in *Street Biker*, the magazine of the Motorcycle Action Group (MAG), Feb./Mar. 2000 issue.

National Statistics/Department for Transport (2003) *Motorcycling in GB – Personal Travel Factsheet 10*. http://www.transtat.dft.gov.uk/personal

Ormston, R., Dudleston, A., Pearson, S. and Stradling, S. (2003) *Evaluation of Bikesafe Scotland*. Research Findings No. 169/2003. The Scottish Executive. http://www.scotland.gov.uk/cru/resfinds/drf169.asp

Preusser, D.F., Williams, A.F. and Ulmer, R.G. (1995) Analysis of Fatal Motorcycle Crashes: Crash Typing. *Accident Analysis and Prevention*, 27(6), 845–851

Reeder, A.I., Alsop, J.C., Langley, J.D. and Waganaar, A.C. (1999) An evaluation of the general effect of the New Zealand graduated driver licensing system on motorcycle traffic crash hospitalisations. *Accident Analysis and Prevention*, 31, 651–661.

Reeder, A.I., Chalmers, D.J. and Langley, J.D. (1996) The risky and protective motorcycling opinions and behaviours of young on-road motorcyclists in New Zealand. *Social Science and Medicine,* 42 (9), 1297–1311.

Royal Society for the Prevention of Accidents (RoSPA) (2001) *Motorcycling Safety Position Paper* http://www.rospa.com/pdfs/road/motorcycle.pdf

Rutter, D.R. and Quine, L. (1996) Age and experience in motorcycle safety. *Accident Analysis and Prevention*, 28 (1), 15–21.

Sabey, B.E. and Taylor, H. (1980) The Known Risks We Run: The Highway. TRRL Supplementary Report 567. Crowthorne: TRRL.

Simons, D.J. (2000) Attentional capture and inattentional blindness. *Trends in Cognitive Sciences*, 4, 147–155.

Sun, S.W., Kahn, D.M. and Swan, K.G. (1999) Lowering the legal blood alcohol level for motorcyclists. *Accident Analysis and Prevention*, 30 (1), 133–136.

Sunderstrom, C.A., Dischinger, P.C., Kerns, T.J. and Trifillis, A.C. (1999) Marijuana and other drug use among automobile and motorcycle drivers treated at a trauma centre. *Accident Analysis and Prevention*, 30 (1), 182–185

Treisman, A. (1996) Feature binding, attention and object perception. In G.W. Humphreys, J. Duncan and A. Treisman (eds) *Attention, Space and Action*: *Studies in Cognitive Neuroscience*. Oxford: OUP, pp. 91–111.

West, R. and French, D. (1993) Direct observation of driving, self-reports of driver behaviour, and accident involvement. *Ergonomics*, 36 (5), 557–567.

Yin, R.K. (1984) Case Study Research. *Applied Social Research Methods vol. 5*. London: Sage Publications.

Yuan, W. (2000) The effectiveness of the ‘ride-bright’ legislation for motorcycles in Singapore. *Accident Analysis and Prevention*, 32 (4), 559–563.

APPENDIX

The questionnaire

Motorcycle Safety Questionnaire

The aim of this questionnaire is to examine road safety from the perspective of motorcycle riders. The questionnaire has been designed to take about 10 minutes to complete and most of the questions can be answered with a tick. Your answers will be treated in the strictest confidence. *Thank you*.

A. EXPERIENCE

1. **How long have you held a motorcycle licence?______** years _____ months

---

2. **Did you start riding a motorcycle *immediately* after acquiring your motorcycle licence?**

   Yes ❐ No ❐ *(Please tick)*

   If *no* how long was the gap between acquiring your licence and riding a motorcycle?

   _______ years _____ months

---

3. **Since you have been riding a motorcycle have there been any periods of time when you have not had access to (or have chosen not to ride) a motorcycle?**

   Yes ❐ No ❐ *(Please tick)*

   If *yes* what is the longest period of time you have *not* ridden for?

   _______ years _____ months

   Approximately how many miles per year do you ride by motorcycle? ___________

   How many miles per year do you drive using other forms of transport? ________

---

4. **Which one of the following describes the type of motorcycle that you ride most frequently?** *(Please tick one box only)*

Moped/scooter	❒	Sports	❒
Learner (125cc or below)	❒	Touring	❒
Commuter	❒	Custom	❒
Off road (trail bikes)	❒	Other	❒
Trike	❒		

Make: ____________________________ Engine size:_______cc

---

5. **Which other motorcycles have you ridden since acquiring your motorcycle licence?** *(Please indicate make(s) and engine size(s) in the space below)*

---

6. **What are your reasons for using a motorcycle?** *(Please tick all that apply)*

Commuting to work	❒	Leisure trips	❒
To visit friends/relatives	❒	Personal errands	❒
As part of your job	❒		
Other	❒	*(Please indicate below)*	

B. TRAINING

7. Which of the following have you undertaken? *(Please tick all that apply)*

❒ Old-style motorcycle test (pre-CBT)

❒ CBT (compulsory basic training)

❒ Motorcycle test on a motorcycle between 75cc and 120cc

❒ Motorcycle test on a motorcycle over 120cc but not more than 125cc

❒ Direct access test (on a machine of at least 46bhp, approximately 500cc)

❒ Advanced rider training

❒ Other (please specify in the space below)

---

8. Are you *now* legally entitled to ride a motorcycle of any size/power?

Yes ❒ No ❒ *(Please tick)*

C. SAFETY

9. What do you think are the main *causes* of motorcycle accidents? *(Please list a maximum of* ***three causes*** in the space below)

---

10. Please read the following list of safety measures for motorcyclists and place a tick in the boxes next to the *three* you think are the *most important*. *(Please remember to* ***only tick three boxes)***

- ❒ Properly maintaining your motorcycle
- ❒ Making yourself visible to other road users
- ❒ Observing the speed limit
- ❒ Not riding while under the influence of drink or drugs
- ❒ Using the correct observation techniques (e.g. lifesaver)
- ❒ Correctly positioning your motorcycle according to road conditions
- ❒ Not riding while tired
- ❒ Wearing protective clothing/helmets/boots

---

11. The same list of safety measures is repeated below. This time please place a tick in the boxes next to the *three* you consider to be the *least important.* *(Please remember to* ***only tick three boxes)***

- ❒ Properly maintaining your motorcycle
- ❒ Making yourself visible to other road users
- ❒ Observing the speed limit
- ❒ Not riding while under the influence of drink or drugs
- ❒ Using the correct observation techniques (e.g. lifesaver)
- ❒ Correctly positioning your motorcycle according to road conditions
- ❒ Not riding while tired
- ❒ Wearing protective clothing/helmets/boots

---

12. Which category of road user do you think is most likely to cause a motorcyclist to have an accident? *(Please* ***tick one box only****)*

The motorcyclists themselves	❒	Cyclists	❒
Car drivers	❒	Pedestrians	❒
Large commercial vehicle drivers (e.g. trucks, buses and coaches)	❒	Don't know	❒

Other ❒ *(Please specify)*

---

13. The following question asks about your riding habits. Please answer truthfully. It is impossible for your answers to be traced back to you. *(Please tick* ***one box from each row****)*

When you are riding your motorcycle how often do you:

	Always	**Frequently (over 50% of the time)**	**Occasionally (less than 50% of the time)**	**Never**	**Don't know**
Wear bright/reflective clothing?	❒	❒	❒	❒	❒
Use daytime headlights?	❒	❒	❒	❒	❒
Wear a protective jacket?	❒	❒	❒	❒	❒
Wear protective trousers?	❒	❒	❒	❒	❒
Ride above the speed limit?	❒	❒	❒	❒	❒
Ride while feeling tired?	❒	❒	❒	❒	❒
Ride while under the influence of drink/drugs?	❒	❒	❒	❒	❒
Remember to use your 'lifesaver'?	❒	❒	❒	❒	❒
Misjudge the speed needed to negotiate a bend in the road?	❒	❒	❒	❒	❒
When overtaking other vehicles how often:					
Are the vehicles travelling at or above the speed limit?	❒	❒	❒	❒	❒
Do you pass two or more vehicles at the same time?	❒	❒	❒	❒	❒

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14. Does the helmet you most frequently wear comply with British Safety Standards? *(Please **tick one box only**)*

Yes (A-type)	❐	No	❐
Yes (B-type)	❐	Don't know	❐

15. Listed below are types of accidents that involve motorcyclists. Please tick the boxes next to the *two* you think motorcyclists are *most at risk* from. *(Please remember to **only tick two boxes**)*

❐ Collisions while overtaking other road users

❐ Being hit from behind by other road users (rear-end shunt)

❐ Collisions with right-turning vehicles

❐ Collisions with left-turning vehicles

❐ Poor riding technique leading to loss of control of the motorcycle

❐ Over-shooting bends in the road

16. The same list of accident types is repeated below. This time please place a tick in the boxes next to the *two* you think motorcyclists are *least at risk* from. *(Please remember to **only tick two boxes**)*

❐ Collisions while overtaking other road users

❐ Being hit from behind by other road users (rear-end shunt)

❐ Collisions with right-turning vehicles

❐ Collisions with left-turning vehicles

❐ Poor riding technique leading to loss of control of the motorcycle

❐ Over-shooting bends in the road

17. Are there any other types of accidents you think motorcyclists are particularly at risk from? *(Please indicate in the space below)*

18. Have you ever been involved in a motorcycle accident *that has resulted in an injury* to yourself or your pillion passenger(s)?

Yes ❐ No ❐ *(Please tick)*

19. Do you have any friends or associates who have been in a motorcycle accident *that has resulted in an injury* to them?

Yes ❒ No ❒ *(Please tick)*

D. PERSONAL DETAILS

For statistical purposes we would be grateful if you could give us some information about yourself.

20. Are you: Male ❒ Female ❒ *(Please tick)*

---

21. Please tick the age group you belong to: *(Please **tick one box only**)*

Under 20 ❒	25 to 29 ❒	35 to 39 ❒	45 to 49 ❒	55 to 59 ❒
20 to 24 ❒	30 to 34 ❒	40 to 44 ❒	50 to 54 ❒	60 + ❒

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22. Which of the following would you describe yourself as? *(Please **tick one box only**)*

White ❒

Asian: Chinese ❒

Black:

Indian ❒

Caribbean ❒

Pakistani ❒

African ❒

Bangladeshi ❒

Other *(Please state below)*

Other Black ❒

Other Asian ❒

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23. Please list any formal qualifications you have in the space below:

---

24. Please describe briefly your present or (if currently unemployed or retired) most recent job in the space below (job title and very brief description of duties will suffice):

---

25. If you would be willing to talk to me in more depth, at a time convenient to yourself, about your views on motorcycling please can you provide some contact details?

Name:

Telephone:

Email:

THANK YOU FOR YOUR TIME.

Countermeasures

1 Ensure foreground to distance is checked properly with a sweeping gaze.

2 Come to a stop at junctions especially if the view is in doubt.

3 Re-check to the right (first point of danger) before pulling out.

4 Give yourself enough time to be sure of the speed of approaching traffic.

5 On approaching junctions, check your speed and look for emerging traffic.

6 Ensure the motorcycle is positioned effectively in the road so other road uses can see you (especially near parked vehicles, obstructions and restricted views).

7 Keep a safe stopping distance from the vehicle in front.

8 Do not allow yourself to become distracted by anything (either inside or outside the vehicle) while driving.

9 Look ahead of the vehicle in front for any hazards that might cause it to slow/stop.

10 Ensure appropriate speed/distance in adverse weather conditions.

11 Ensure appropriate speed for bend severity: if in doubt slow down.

12 Ensure correct positioning while negotiating bend.

13 Avoid braking while travelling around a bend; finish braking before entry.

14 Check blind spot immediately before manoeuvre (i.e. when overtaking, turning or changing lanes).

15 Give clear signal of intention in plenty of time before manoeuvring.

16 Avoid overtaking in vicinity of a junction.

17 Avoid crossing solid white lines during a manoeuvre.

18 Move cautiously through traffic when filtering.

19 Avoid overtaking a vehicle travelling at or near the speed limit.

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