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Social Psychological Aspects of Driver Behaviour and Accident Potential in Younger Drivers

by

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ABSTRACT

FACULTY OF SOCIAL SCIENCE

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Young drivers (under 26 years) are over-represented in the accident statistics. Until recently, there has been limited research in the U.K. relating characteristics of young drivers with accident risk, other than analysis of statistics and studies of drink-driving. Many of these traditional approaches, which adopt the view of driving as being a predominantly skill based activity, are shown to be of limited use in explaining the driving behaviour of younger drivers (predominantly males) once a driver has acquired the necessary skills required to drive. After this stage, other influences have an increasing effect on driving behaviour.

There is scope for a new multi-method approach concentrating on the social aspects of car driving behaviour. This thesis contributes to the understanding of car driving behaviour by examining a number of fundamental social issues which underlie car driver behaviour and which can be explained with reference to several psychological theories or hypotheses. Issues which are addressed include: driver ability and risk assessment, lifestyle, perceptions of cars and driving, peer and passenger effects, drinking behaviour and the car culture of young male drivers. Particular emphasis is placed on how and to what extent these affect younger male car driving behaviour.

Two studies are reported. The first, which involved 439 drivers, identified a number of aspects of driver behaviour and performance which help to account for the different accident involvement rates across age whilst taking into account driving experience and exposure. The first study identified inter-group differences, the second explored, in more detail, intra-group differences evident within the younger male group (17-25 year olds). This involved interviewing 56 drivers, previously categorised as 'safe' or 'unsafe' drivers and giving them the opportunity to provide their own accounts and explanations for their driving behaviour based on their own realities and experiences. Results demonstrate the merit of such a qualitative approach and show that young drivers should not be treated or labelled as one homogeneous group.

An argument is presented for further investigation into 'young problem drivers' rather than the 'young driver problem' which has been largely concentrated on to date. In-depth understanding of the driving phenomenon will assist in developing effective measures to overcome those characteristics of driving and social behaviour which are identified as contributory factors to accident involvement, such measures could involve education, training, publicity and policy changes.

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I would like to thank Roger Ingham for supervising this thesis and for providing encouragement and support. Thanks are also due to Chris Colbourn who offered help with the work at a particularly crucial time.

I would also like to acknowledge Richard Hall who conducted the multivariate regression analysis described on pages 116-125. It is included in order that as full an understanding of the research study is presented and that it could be included in the chapter discussion, but all credit for this analysis should rest with him.

1 THE PHENOMENON OF THE YOUNGER DRIVER

1.1 Introduction

It is well established that younger drivers, particularly 17-19 year olds, are over-represented in the casualty rates. Indeed, Leonard Evans (1991) has gone so far as to state that this over-representation of young male road users is *'so robust and repeatable that it is almost like a law of nature'* (p.41).

Young drivers have been the focus of much research and even more academic and journalistic articles. However, there is still disagreement as to why young drivers are over-represented in the accident statistics. The work presented here sought to explore some newer research areas which might help to account for the young driver accident phenomenon.

Much traffic safety research has concentrated on epidemiology and has involved relatively large scale, quantitative methods. A number of constructive criticisms will be made of such approaches, based on first hand experience and an argument will be made for the adoption of multi-method research including (in particular) in-depth, qualitative research which has tended to be little used in the driver behaviour field.

It is recognised that, inevitably, any method chosen to study young drivers has limitations, one of the problems being to define the appropriate data to collect and analyse. The worry is that researchers define the research questions which may not encompass the everyday reality for the participants themselves. No research perspective is right or wrong, the more perspectives brought to the study of a phenomenon, the more researchers can begin to understand the phenomenon and overcome the limitations of any one perspective alone.

The first study (Study I - Chapter 3) favoured more quantitative methods, whilst the second (Study II - Chapters 4-7) favoured a qualitative approach. Although the two studies can be dealt with separately, in reality the second was a continuation of the first.

Study I sought to identify aspects of driver performance, attitudes and behaviour that related to accident involvement of young drivers (17-25 years) of both sexes, through a comparison process with drivers in the 30-40 year old age bracket.

From the results of this study, it became evident that not all young male drivers could be treated, as they have been so often in the past, as one homogeneous group; not all young drivers drive unsafely or have accidents.

As a consequence of this, the main aim of Study II was to extend traditional approaches to driver behaviour and explore some of the more general lifestyle factors associated with two groups of young, male drivers previously identified as 'safe' and 'unsafe' drivers. The methodology involved giving the young drivers the opportunity to forward their own accounts and explanations for their driving behaviour based on their own realities and experiences. Factors which might influence their driving behaviour included their own interpretation and perception of risk, needs and motives for driving, attitudes to driving, meaning and purpose of the car, lifestyle patterns and social group influence amongst others.

1.2 Extent of the traffic accident problem

It is estimated that worldwide, about half a million people are killed annually in traffic accidents (Hutchinson, 1987). In 1990, in Great Britain, there were 258,441 reported personal injury accidents with 5,217 fatalities, 60,441 serious injuries, and 275,483 slight injuries, making a total of 341,141 casualties. For ages 15-19 years, road accident deaths accounted for as many as 40% of all male deaths and 25% of all female deaths and remain by far the main cause of accidental death for people aged between 15 to 24 years inclusive (Department of Transport, 1991). Broughton (1988) estimated that of 1000 male motorists who start driving at 17 and live to 70 years, 3.3 will have been killed driving a car, 37 will have been seriously injured and as many as 132 slightly injured.

Thus it can be seen that death and injuries connected with road accidents form *'a public health problem of the first magnitude'* (Knapper and Cropley, 1981, p.192). Indeed, as public health in general improves, road accidents account for higher and higher proportions of all injuries and deaths in the population.

The cost of road accidents and related side effects is enormous. The cost in terms of human suffering and loss is obviously immense and, to a lesser extent, so are the financial costs to a society (where lost time and lives can be translated into lost income and revenue). In Great Britain in 1989, the total cost of road accidents was estimated to be £6,360m (Department of Transport, 1990).

Accidents and casualties are not the only consequences of traffic accidents. Travel patterns are disturbed by unsafe behaviour on the road. Some journeys, particularly those made by so-called 'vulnerable road users'; for example, pedestrians and cyclists may be frustrated by the fear of having an accident. Numerous other activities, such as children's travel for social and leisure purposes, are also affected. In short, the danger of traffic has wider implications and has a greater adverse effect on people's lives than the official statistics show. It is sometimes argued that the over-reliance on inadequate official statistics and unrealistic cost assessments has contributed to the fact that traffic safety is not accorded the high priority that it arguably merits (Plowden and Hillman, 1984).

With around 90% of traffic injury accidents occurring as a result of some element of driver error (Clayton and Mackay, 1972; Jenkins, 1978; Sabey and Taylor, 1980) it is imperative to gain as great an insight into driver behaviour as possible.

As Haight (1988) commented, on efforts to improve traffic safety, *'many of us have heard demands that we 'do something', but it is only recently that there have been suggestions that we should 'know what we are doing' before we begin it'* (p.4). It is hoped that this work will contribute to the understanding of the traffic safety problem associated with young male drivers.

1.3 Traffic accident characteristics

An enormous amount of research has been conducted on the characteristics of traffic accidents. Much of this has depended on distinguishing variables associated with the driver such as sex, age, driver experience and exposure. Other research has identified characteristics connected with the accident such as vehicle and environmental characteristics and some studies have examined all these characteristics in combination. A mass of information has been collected which helps to identify who (i.e. which driver groups) have the most crashes, what type of crashes they are, where and when they occur. However, it is debateable whether such studies can explain why these accident characteristics emerge. Of course, it is recognised that many of these studies were not designed for that purpose. Some earlier studies which provide essential background and a starting point for the current work will be mentioned briefly as will a number of problems which have been identified with such research.

1.3.1 Driver sex, age, experience and exposure

In many studies influential variables on the accident rate are taken to be age, sex, driver experience and exposure. It is generally agreed that male drivers are more likely to be involved in an accident per mile than female drivers (Broughton, 1988). Where there is less agreement however, is how such patterns can be explained.

Some research indicates that age or youth *per se* is the dominant factor in accident involvement (Levy, 1990; Pelz and Schuman, 1971) and some that low experience, accompanied by a general lack of driving skills, has more effect (Michels and Schneider, 1984). Many studies appear to show that age, experience and exposure are somehow linked to accident involvement, but as Brown (1982) pointed out, often age and experience variables are confounded.

One of the major problems with much previous research is that these variables (with the exception of sex) have never been clearly defined and used consistently. Thus, we have the definition of 'young' drivers varying from any range between 16 to 25 years; driving experience measured in terms of time licence held, time started driving or number of miles driven, sometimes incorporating amount or type of driving experience, but more frequently not.

The definition of exposure is even more confused, since the definition depends on the context. Exposure in the traffic safety field normally refers to the risk of an injury or accident, taking into account the frequency with which that person is exposed to the possibility of injury or accident occurrence. Thus, a person driving a high annual mileage is more exposed to the possibility of injury or accident occurrence than a low mileage driver and may have a better annual accident record per mile driven than the low mileage driver who has however, had fewer accidents in their driving career. Measures of exposure such as this can incorporate rate per unit of distance of travel, but there is the additional problem that identical driving conditions cannot be assumed. Different driving situations such as driving at night and/or drunk increase the likelihood of an accident and might be included in a comprehensive definition of exposure. An argument could also be made that vulnerability to accident impacts, driver speed, car size, passenger presence, road type and numerous other factors might be included in some exposure definitions dependent on the purpose of the particular study. This illustrates the difficulty and it is perhaps best to view exposure as some simple measure such as accidents per distance travelled. It is little wonder that researchers do not agree on the individual importance of each of these variables when they cannot agree on the usage of the terms.

Early attempts to discover if age is an important determining variable on frequency and type of road accidents, did appear to confirm such suspicions. However, much of this early work in the 1950's used very small samples and did not take account of the type of vehicle driven or ridden.

A more up-to-date analysis of the 1990 casualty rates of car drivers per 100,000 population by age, showed that young drivers in the 17-19 age group had a fatality rate about two and a half times higher than those drivers in any of the age groups over 30 years (Department of Transport, 1991). These figures are not controlled for exposure, but it is likely that if they were the data would show even wider variations. A similarly high rate was found in the 20-29 year age group, but this high rate may have been due to the large number of accidents that are known to occur to the under 26 age group. It would have been more useful if this age band had been subdivided into two. As age increases, these differences may not be so marked and, therefore, use of a ten year age band in the 30-39 age group and older is more acceptable.

A potentially revealing finding was that the rate of passengers being killed showed a different pattern to car driver death rates. The passenger death rate for the 17-19 year age group was up to six times higher than some of the older age groups (Department of Transport, 1991). This may merely indicate that 17-19 year olds were six times more often passengers in cars than the other age groups. Alternatively, these figures may provide the first hint to suggest that passenger presence exerts an influence on car driver behaviour. However, valid interpretation of such figures is difficult (see Section 1.8.2 for more detailed comment). Broughton (1988) examined occupant casualties in two-car accidents, but recognised the need for comprehensive data on car occupancy before being able to draw any firm conclusions.

Broughton (1988) calculated car driver accident-involvement and casualty rates per thousand drivers and also per kilometre driven and plotted graphs which were similar to that of Moore *et al.* (1982) showing the particularly high car driver accident-involvement and casualty rates per thousand drivers of male drivers aged under 29 years. The accident involvement and casualty rates per kilometre travelled were also extremely high for young male drivers (particularly fatalities), but these figures were surpassed by older female drivers aged at least 74, possibly due to the small group size and low annual mileage. Such work confirms the relatively high accident risk of younger drivers, particularly male drivers, taking into account mileage driven.

Pelz and Schuman (1971) attempted to disentangle the effects of age, exposure and experience by examining the literature to find out what age between 16 and 25 years was the most dangerous for car drivers. They found that many studies used age brackets of three, five or ten years. Although higher rates of accident involvement were commonly found in the youngest groups, it was not possible to conclude a monotonic trend within each age bracket. McFarland and Moore (1964) found that 16 year old drivers had the highest accident involvement (in Connecticut) and personal injury accident ratios (in Massachusetts) but used data from different sources in their analyses. Pelz and Schuman (*op cit*) re-analysed the data by comparing the Massachusetts rate against the Connecticut rate and found the resulting ratio of injurious to total accidents to be highest at ages 18 and 19. They found, in a series of studies, a steady rise in likelihood of crashes and violations during the first three or four years.

However, it is preferable to use data from the same sample as Lauer (1952) did with a sample of 7,692 Iowa licensees. He found that mean accidents per male driver over a two year period rose from only 0.07 at 16 years to 0.37 at 21 years of age.

Ferdun *et al.* (1967) found a different pattern with their sample of 6,600 California drivers. In this study, the mean number of crashes by age (16-19 years) was the same across age, but violations increased with age for both sexes.

Pelz and Schuman (1971) also examined the effect of driving exposure in terms of annual mileage. Mean mileage for men generally rose with age up to about 24 years of age when it levelled out, whilst for women it rose up to the age of 23 and then dropped somewhat. These figures did not provide support for the suggestion by Klein (1966) that young drivers have more accidents per year because they drive more miles, if anything the reverse appeared to be evident.

Pelz and Schuman (1971) next attempted to take into account not only driving exposure in terms of mileage but also a number of other conditions such as driving at night, driving on different types of road and so on. Results showed that *'danger continued to be greatest for young males who were either 18 or 19 years old'* (p.76).

The effect of driving experience, examined by Pelz and Schuman (1971) led them to conclude that *'driving experience - measured in this case from the time when the young man (sic) said he learned to drive - did not appear so important as age itself in accounting for infractions'* (p.78). However, it has been questioned whether the measure of length of time since a person started to drive is an adequate measure of driving experience, ignoring as it does amount or type of driving experience (Groeger and Brown, 1989).

Michels and Schneider (1984) examined the effect of experience (measured in terms of length of time licence held) on levels of traffic offending. Inexperienced drivers (licence held less than two years) of various ages (from 18 years upwards) were found to commit a similar number of offences. Drivers differing in experience from less than two years to more than four years were found to differ in the types and number of offences. They concluded that experience was more important than age.

Levy (1990) examined the effect of driver age, driving experience and mandatory driver education on traffic fatalities of youth using data from 47 States in the U.S.A. The results showed that age of driver was an important determinant of fatalities and that *'driving experience appears to have very minor, if any, influence'* (p.334). However, Levy (1990) did state that the experience effect warranted further research due to measurement difficulties experienced.

Laberge-Nadeau *et al.*, (1992) found age to be a more influential variable than experience on injury accident rates since the rates decreased with age (18 to 24) for both experienced and inexperienced driver sub-populations. Although the trend was similar for both sexes, the decrease was less for female drivers. In addition, they found that young male drivers with at least one year's driving experience had higher accident rates than those with <u>less</u> than one year's experience. However, this study did not take account of possible differing exposure levels between the different driving sub-groups and it may be that these inexperienced drivers have lower accident rates due to lower mileage. Despite this, Laberge-Nadeau *et al.* (*op cit*) concluded that driving experience only has an effect of reducing the male injury accident rate after 2.5 years of driving experience. The explanation for this was that driving experience is acquired in a safe way initially because it is vital for the newly qualified driver to familiarise him- or herself with the vehicle.

Many studies that have been cited as providing evidence that youth *per se* is the problem with young drivers are based on observations of drivers performing specific behaviours where age has been estimated by appearance. Studies have shown that younger drivers speed more often (Harrington and McBride, 1970); adopt shorter headways (Evans and Wasielewski, 1983); have shorter gap acceptance (Bottom and Ashworth, 1978) and have higher approach speeds to signals (Konecni, Ebbesen and Konecni, 1976) than older drivers. Such studies can be criticised for not reporting the proportion of young drivers who did or did not engage in such activities, not controlling for time of day or demographic differences of observed site usage and for not obtaining a measurement of age more accurately. However, even if all these factors had been taken into account the possible effects of age and experience would still have been confounded.

The most recent, and extremely large, study into accident liability (the expected number of accident involvements per year) was conducted by Maycock, Lockwood and Lester (1991) and involved 18,500 drivers completing a postal questionnaire. The study used self reported accident involvement rates (mainly 'damage only' accidents) of the drivers over the previous three years. Results showed that accident liability was dependent largely on exposure (number of miles driven per year), the driver's age and their driving experience (number of years since passed test). Examining the study in detail, it would appear that for under 20 year olds, driving experience (independent of age effects) is more influential than age (independent of experience) (Maycock, Lockwood and Lester (1991), Table 11, p.15).

Mayhew and Simpson (1990) conducted a review of previous studies and found no clear evidence that either age or experience could on their own account for higher crash risk of younger drivers. It was concluded that the relative combination of these factors remains unknown. However, the same authors conducted their own study which appeared to demonstrate that the age effect is larger than the experience effect, although both remain implicated.

An enormous amount of research has been spent on trying to untangle the effects of age and experience on accident liability for a number of reasons. Firstly, since so much research shows a connection between driver age, experience and driver behaviour, researchers believe there are good grounds for stating that these factors influence driver behaviour. If age can be shown to be the dominant factor, then (short of increasing the maturation process) raising the driving age may be a countermeasure to young people's accident liability. If experience is shown to be the dominant factor then *'improved safety might be achieved by devising better ways of imparting those skills necessary for safe driving to novice drivers - a matter of training'* (Maycock, Lockwood and Lester, 1991, p.1). Such an explanation can only be contemplated if it is accepted that the effects of age and experience can be adequately disentangled.

It is evident that the true effects of age, experience and exposure (however defined above) on accident liability are unclear. Much work has been devoted to the subject and yet findings remain inconclusive. It is debateable whether much useful contribution can be made to the current age and experience debate. Clear-cut results may be illusory since the effects of driving experience on driver behaviour are inevitably inter-related and confounded with other variables such as driver age and exposure. Young drivers self-evidently have little experience whilst older drivers have usually been driving for a long time and there may be exceptional reasons why those older drivers with little experience have not driven before.

It is arguable that even if it could be established precisely how accident liability is related to age, experience and sex this fact, in itself, although interesting, is unlikely to substantially further our understanding of why different age and sex groups (or certain sub-groups of drivers) have differing accident involvement levels. It may be that work which investigates lesser known social factors may prove more fruitful in explaining why young drivers are over-involved in the accident statistics whilst taking into account age and experience factors but not being controlled or directed by them.

Indeed, Maycock, Lockwood and Lester (1991), after conducting their research largely on age and experience factors concluded *'in terms of road safety remedial measures, it is obviously not possible to make direct use of the age/experience effects evidenced...some understanding of the socio-psychological mechanisms underlying these effects is needed'* (p.14).

1.3.2 Other characteristics

Driver characteristics are the most important factors in traffic accident causation (Sabey and Taylor, 1980). Nevertheless, the examination of a number of other factors connected to an accident can add to the understanding of traffic accidents. Some of these factors which are appropriate to this thesis will be briefly mentioned.

1.3.2.1 Type of road

Broughton (1988) calculated the casualty and accident involvement rates for different types of road distinguishing between built-up and non built-up roads according to speed limit. Casualty rates showed that male and female rates were very similar in built-up areas but male rates were higher in non built-up areas.

1.3.2.2 Type of accident

Broughton (1988) also investigated the types of accident in which different groups of drivers were involved. Accidents were categorised by the characteristics of the other vehicles and road users involved.

Accident involvement and casualty rates per thousand drivers in 1985 varied with age, sex and accident type. One of the most common types of accident for young drivers was the Single Vehicle Accident (SVA); more male drivers aged 17-20 were injured in this type of accident than any other. Yet this rate decreased quite substantially with an increase in age until it was the least common accident type for male drivers over 35. In addition, the male casualty rates for SVA's were over twice the female rate (also McKenna, 1987).

Broughton (1988) concluded that the 'all casualties' rates for both sexes were similar for all ages and all accident types, except SVAs with no pedestrian involvement, the difference being explained by the higher involvement of young male drivers in SVAs with no pedestrian.

It was also noted that the ratio of killed/or seriously injured to overall accident involvement rates was generally higher for males than females for all types of accident.

Broughton (1988) showed that male drivers were more likely to be involved in an accident per mile driven than female drivers, but that the proportion of females injured in accidents was likely to be higher than the proportion of males. He gave the proportion of accident involved drivers who were injured as 10% to 25% higher for females than for males for each type of accident.

1.3.2.3 Time of day

Broughton (1988) analysed casualty rates per thousand drivers by time of day, sex and age. As with earlier studies (Storie, 1977), differences were observed between the sexes as to the time of day of the peak accident times. The peak time which was most striking was the one between 8pm and 4am involving young male drivers. The highest rate was between 10pm and midnight for males up to age 28; by contrast, the highest rate for all age groups of female drivers occurred between 4pm and 6pm.

Differences between age and sex categories presumably arise due to varying social and travel patterns and the resulting exposure levels. Broughton (1988) found that for accidents involving a male driver in the 17-20 year age band, 44% occurred during darkness, compared to only 19% of accidents for the male driver category over 64 years. The corresponding figures for female drivers were 35% and 14%.

Results from Broughton and Stark (1986) suggest that the male accident involvement rate fell in the five years from 1980 more or less in line with the 'all casualties' rate, but that this fall was less for the midnight to 4am time span. Female rates did not show such a general decline and in some instances (early evening and early morning) showed an increase.

1.3.2.4 Day of week

Storie (1977) found that 79% of accident-involved female drivers had their accidents on weekdays compared to 70% of male drivers. Broughton (1988), with more up to date statistics (1985), analysed the casualty rate by day of the week and found that this difference was largely explained by the high weekend rate among young male drivers, particularly under 20 years of age. With age groups over 24 years for males, and 20 years for females, the casualty rate was at its highest on a Friday.

1.4 Problems

Perhaps the main criticism of much traffic safety research is that it often relies on official traffic accident data sources. Official accident statistics undoubtedly underestimate the true number of accidents and casualties. Even the numbers of fatalities which are fully reported may not provide a completely accurate picture due to the narrow 'official' definition of a fatality: thus deaths that occur in Great Britain more than 30 days after the road accident are not included. The most obvious reasons for the inaccuracy of the accident statistics are that many 'accidents' do not involve injury or report to the police.

It cannot be assumed that the level of under-reporting is uniform across age and sex of driver or across type of accident; indeed, it is perhaps more likely not to be. Hakkert and Hauer (1988) reviewed several studies that have been conducted on accident reportage, most of which based their estimates of the proportion of accidents reported to the police on comparisons of police data and hospital files. They showed that the proportion of accidents reported to the police decreases with the decreasing severity of the outcome. Police records miss about 20% of injuries that require hospital treatment and up to 50% of the more minor injuries which do not. There are also different levels of reporting dependent on a number of other factors such as age of injured person (as age increases so do levels of reporting), number of vehicles involved (multi-vehicle accidents have higher levels of reporting) and whether the injured person was driving (highest level of reporting) or a non-occupant of the vehicle. Faulkner (1968) estimated 'real' accident rates were ten times the reported injury accident rates and comparisons of hospital and police data in Birmingham showed under-reporting of serious casualties to be 18% and slight casualties to be 35% (Bull and Roberts, 1973). A later study in Berkshire produced similar results (Hobbs, Grattan and Hobbs, 1979). It is highly likely that some injuries treated in hospitals are not recognised as having their origin in a road accident and a number of slight injuries, including some severe enough to merit a stay in hospital, are not treated in hospital at all.

Probability of injury in any accident and subsequent report to police is more likely as the speed of impact increases and thus it is suggested that the faster travelling vehicle accidents are more likely to be represented in national accident statistics. There are a number of other factors which play an equally important part. For example, the greater the number of passengers, the greater the likelihood of injuries resulting from an accident, this being particularly true of back seat passengers who do not wear seat belts. Thus, cars with passengers which become involved in an accident have a greater likelihood of being included in the national statistics than cars without passengers.

There is also a small minority of non-injurious accidents which take place at considerably higher speed. Some of the reasons why such accidents do not result in injury include the differences between people's sizes, physical characteristics, seated position at impact, age and tolerance to injury.

Similarly, the type of collision can have an effect on whether the accident gets recorded in the national statistics. For example, a head-on collision is more likely to result in injury and thus be recorded as a statistic than a rear-end collision; this means that head-on collisions are likely to be over-represented in national statistics compared to rear-end collisions.

Again, it is perhaps reasonable to assume that accidents in built-up areas, where speeds are lower than in rural areas, are less likely to result in injury and therefore be reported. On the other hand, it is likely that police are less likely to be around in rural areas.

All national accident statistics must be viewed in the light that certain types of accidents are more likely to result in injury and subsequently be recorded as accidents than certain other types of accidents (Plowden and Hillman, 1984).

There is a real need to improve the standard and availability of access to accident data since it is such a widely used source of information for road safety and traffic engineering purposes despite the fact that accident statistics are not collected for this purpose.

A considerable amount of research on road accidents and traffic behaviour involves *ex post facto* scrutiny of characteristics of those individuals involved in crashes. The bulk of research involves starting with a particular dependent variable (for example, number of casualties) and then working backwards to try and pinpoint causal factors. Traffic accident statistics do not, in any systematic way, help to explain car driver behaviour; they portray some of the limited results of car driver behaviour but do not illustrate the cause of the behaviour.

Due to the number of problems with official statistics (not exclusively traffic accident statistics), their collection, their use, their worth and contribution to the problem have been questioned by Harre (1979) who stated that *'it is clear that they (official statistics) form no basis for any kind of science, except that of the study of modern forms of rhetoric'* (p.114).

Some other shortcomings of research in the driving behaviour field related to accident causation which rely on accident statistics include the general failure to go beyond mere observable behaviour and examine the underlying motivations and attitudes that might help to explain differences between drivers. Driving must be examined in a much broader context than is often apparent in a number of studies. Many drivers are intuitively aware that a good deal of driving behaviour is influenced by the social and cultural context in which driving occurs, including such factors as social norms, status, social interaction, conformity behaviour and so on.

Another limitation of much of the research in the area of accident causation is that it often attempts to analyse single factors which contribute to the problem. Although more difficult to achieve, studies must attempt to look at multivariate factors. Driving is undoubtedly an extremely complicated behaviour to try to understand and studies which have looked at factors such as age, sex, exposure, and so on, in isolation, cannot determine exactly all the sets of factors that might be involved or how much weight and influence should be given to each factor. Without looking at these interactions it is impossible to try and devise appropriate countermeasures which might be of use.

This list of deficiencies in research which relies on official accident records does not mean that all such studies into the young driver problem have so many limitations that they are worthless. Indeed, as will be shown, a considerable amount of knowledge concerning the problem has been amassed. The shortcomings of earlier research has been mentioned since this work has been developed in the knowledge of the current state of research on the phenomenon, based on the most promising research areas using a multi-method approach, with the emphasis on qualitative research.

Meanwhile, it is important to look at the findings that previous work has already produced.

1.5 The potential of the 'human factor' influence

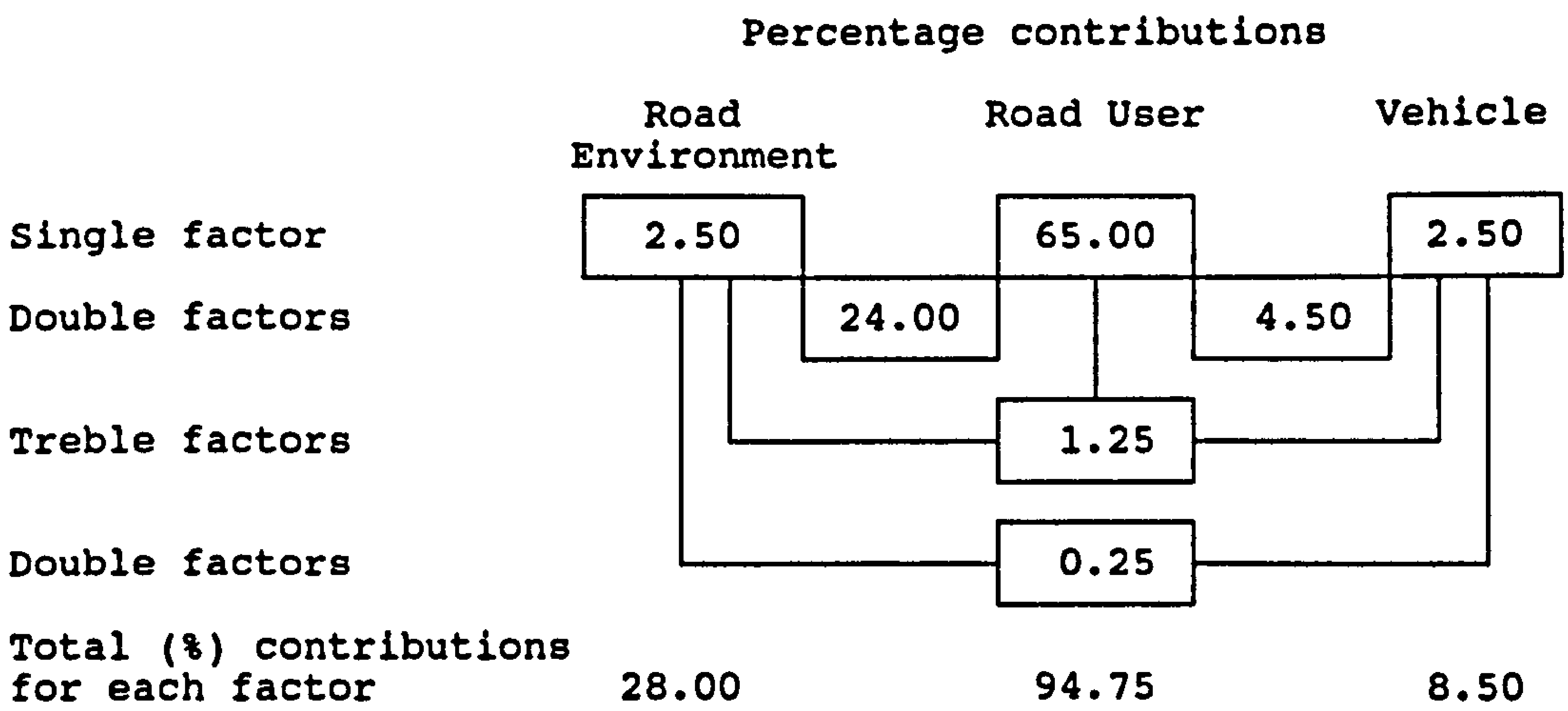
Traffic safety research has involved the study of three broad factors which contribute to accidents: the vehicle, the road environment and the driver, as well as the interactions between all three.

Comparatively more money and time has been spent investigating and improving the first two factors, vehicles and their road environment than the latter, namely, the human operator. Reasons for this may include the initial reaction that it is perhaps easier to study, measure and improve upon mechanical factors than human factors. This is a specious argument since the relative contribution of each of the above factors to accident causation is ignored.

Clayton and Mackay (1972) concluded from their work that 44.7% of accidents were attributable to the road user and a further 31% to the interaction between the driver and the environment. Only 8.6% of accidents were attributable to the environment or vehicle alone with the small remaining percentage of accidents attributed to a combination of these factors.

As part of an international survey of drivers attitudes to road safety, 1,400 drivers in U.K. were sent a questionnaire (Jenkins, 1978). Consistent with other research, results showed that the majority of drivers (87%) believed that human error was the dominant cause of road accidents. Inattention was rated the most important causative factor of accidents with aggressive behaviour, tiredness and inexperience being ranked in that (descending) order.

Various studies have estimated the importance of different factors and their relative contribution to road accidents but perhaps the most thorough work was reported by Sabey and Taylor (1980), using data collected in a previous study (Sabey and Staughton, 1975). Sabey and Taylor (*op cit*) assessed the relative importance of the three factors of road environment, road user and vehicle and the results are shown Figure 1.1.



(Sabey and Taylor, 1980)

Figure 1.1: Relative contribution of road environment, vehicle and road user to traffic accidents.

Of particular significance was the finding that in 95% of the accidents, human factors were present. Such a high figure could be argued as indisputable evidence that human factors research should be the dominant area of study. Indeed, it is quite difficult to imagine an occasion where human action of one sort or another could not prevent an accident.

Sabey (1980) considered the respective measures of success of adopting different approaches. The principle applied involved four calculations:-

(i) to quantify savings from individual measures

(ii) to identify the target group of accident or casualty types amenable to change

(iii) to apply the estimated savings to the target group

(iv) to relate these savings to the total accident or casualty situation

Thus, if a particular measure suggests a return of A percent in accidents or injuries and is applicable to B percent of the total accidents or injuries, then the resultant potential saving is AxB percent. Several measures to reduce accident risk were considered under the three broad headings of road user, vehicle and road environment. Potential savings in terms of injury accidents from remedies applied in the three main areas were around:-

road environment	- one-fifth	(E)
vehicle	- one-quarter	(V)
road user and usage	- one third	(U)

Sabey and Taylor (1980) estimated the combined interactive effect to be a potential overall saving of three-fifths, which represents a substantial impact on the road accident toll. In reality, it is likely that this potential is not met, even assuming that remedies proven to be effective in the past continue to be so in the future.

With regard to remedial measures, Grime (1987) agreed with Sabey and Taylor (1985) when he stated that, *'the most effective remedy is not necessarily related directly to the main cause of the accident and may even lie in a different area. This is particularly true of accidents in which the road user fails to cope with the* *road environment. Further, even in circumstances in which human error or impairment has been judged to be the sole contributor, it may be possible to influence human behaviour more readily by engineering means than by education, training or enforcement of legislation'* (Grime, 1987, p.10). This is a view quite commonly held because the greatest potential for accident reduction lies in the field of influencing human behaviour and this is, without doubt, the most difficult approach to adopt. In the last few years, there has been a growing recognition that the traditional engineering approach of improving roads and vehicles are beginning to show diminishing safety benefit returns. It is generally accepted that long term benefits are to be gained by concentrating greater resources on influencing the road users themselves. Before this can be successfully achieved however, greater insight and understanding of road user behaviour is essential.

Evans (1991) placed the importance of human infrastructure above engineering infrastructure stating that engineering changes seem inadequate to account for the 90% reduction in fatality rate per billion km in the USA since the 1920's. In addition, the importance of individual driver attributes is apparent from the much higher crash rates of younger drivers. It is doubtful whether skill and knowledge factors can adequately account for these different rates so the source of the explanation must lie elsewhere (Conley and Smiley, 1976; Duncan *et al.*, 1991; Lester, 1991).

There is a very real danger that one can overemphasise one factor in the causation of an accident and thus bias the true picture. In this way, it is all too easy to quote studies which indicate that human factors are by far the major contributory factor in accident causation and conclude that human factors should be the major area of future study. However, this is to oversimplify and distort the situation. In most accidents, many factors can play a contributory role such as inadequate road lighting, vehicle defects, poor road design, difficult weather conditions as well as driver error which may involve fatigue, lack of concentration and so on. It is sometimes tempting to state that there is one factor which causes an accident because without that particular factor present an accident might have been avoided.

As an example, a hypothetical case of a motorway driver who falls asleep at the wheel can be examined. The major factor or cause of the accident is undoubtedly human error in not realising one's fatigue level. However, it may also be the case that the car that was being driven had a faulty heating system that only pumped out hot air, or that the car journey took a particularly long time due to the age and condition of the engine or that the motorway environment lacked sufficient visual stimulation to keep the driver awake. In this case, all factors play a part, however small, in the resultant accident and to put the cause merely on driver error would be misleading.

With respect to road user behaviour, it is essential to try and understand the influences, motives and mechanisms which lie behind the behaviour of road users. Once these are more fully understood then it may be possible to successfully encourage safer road user behaviour. As Sabey and Taylor (1980) stated, *'influencing the road user is the most difficult safety measure to effect, but when it can be achieved it can also be the most dramatic'* (p.17).

1.6 Previous studies

Much research in the past on driver behaviour tended to be based on the idea that driving takes place in a sort of 'social vacuum'. Early psychological work concentrated on the concept of 'accident proneness' suggesting that certain drivers have more than their average share of accidents and that with these drivers selected out of the system, fewer accidents would occur (Greenwood, 1950; Tillmann and Hobbs, 1949). The major flaw with the argument was that tests were not predictive probably because people who have accidents over one period of time are not necessarily those who have accidents in the next; this was shown in a study of workers in heavy industry (Mohr and Clemmer, 1988). In addition, it is argued that strategies of selection which were advocated may not be acceptable in many societies. Accident proneness as a concept lost popularity, although McGuire (1970) put forward a case for temporary or short term accident prone individuals. Since this type of research, work has been conducted in a number of different areas ranging from behavioural and cognitive psychology to social psychology. Much of the research has produced equivocal findings and that which is not directly relevant to this thesis will not be discussed (see Lester, 1991; and McKenna, 1982; for review).

The idea that driving may be viewed as a social activity which involves social interactions in traffic has been around for the last 40 or 50 years (Ross, 1940; Stewart, 1958), but it is only comparatively recently that research has begun to investigate the nature of these social influences on driving. Some of the ways in which this has been done and which provide a relevant background to the present study are outlined in the Introductory Sections of the appropriate chapters which follow below.

1.7 Promising research areas

Perhaps the main criticism of previous research is that it is based on the assumption of a closed system model whereby the driver, car, road environment system are all closed systems of limited capacity. This approach is criticised because it reduces people to the level of an inanimate machine. Such an approach is too simplistic in that it denies the possibility that people can initiate their own action; modern social psychology recognises that people interpret and act on the world in a personal way, and ascribe meaning to the various components of the social world (Harre *et al.*, 1985). Driving is only one particular social activity that is influenced by prevailing social mores and norms which may not be conducive to safety and thus limit the effectiveness of planned engineering or legislative changes.

Since the highly publicised failure of early psychological work into the theory of accident proneness, research has encompassed a wide range of theoretical stances ranging from the behavioural, the cognitive, perceptual, personality, attitudinal to biographical and social stances. Each of these fields has contributed to the current traffic safety body of knowledge. However, as Knapper and Cropley (1981) point out *'it appears that the practical usefulness of much psychological work in the area of driving behaviour is of questionable utility'* (p.351) (for example, Doob and Gross, 1976). Many 'psychological' studies which use a variety of testing techniques do not seem to be able to progress very far in the understanding of driver behaviour.

As long ago as 1964, Haddon, Suchman and Klein, stated that *'by and large it appears that the behavioural scientist would have much more to contribute to accident research if he (sic) devoted relatively less attention to individual factors and more to 'social attitudes and behaviour'* (p.280).

Since the mid 1970s, there has been a move to the idea of incorporating social and psychological viewpoints in transportation research rather than concentrating solely on technological and engineering viewpoints. As Michon (1976) pointed out, *'some - presumably psychologists - are highly optimistic about the potentiality of behavioural science in this field (of transportation research). Conversely, there are sceptics - presumably engineers'* (p.222).

It is apparent that a number of writers support and advocate the need for a greater contribution and understanding of social and psychological factors in the field of transportation (Appleyard, 1976; Evans, 1991). However, as Warman (1976) pointed out *'whilst the need for a sociological and psychological input is recognised nowadays, by no means has it been recognised how these additional disciplines can be effectively integrated ....'* (p.237).

Although human factors research is often used to broadly encompass all types of work in the driver behaviour field (see Section 1.5 above), Klein (1976) pointed out the distinction between 'human factors' and the 'social perspective' of the driver. Human factors research is based on the assumption that the 'interaction' (or 'fit') between the driver and the vehicle can continuously be improved and monitored. Although such an approach may be applicable in certain areas, for example, professional airline pilots, it is obviously impractical to do this for individual car drivers. To overcome this, 'human factors' research examines the 'average' or 'typical' driver. However, the use of 'average' drivers may be irrelevant given the fact that crashes do not randomly occur within the driver population and that virtually every adult is eligible for a license. Indeed, the same individual driver is likely to drive in a different manner under different physiological, psychological and social circumstances.

From the 'social perspective', the vehicle and road environment are viewed as small parts of the driver's total environment. This approach suggests that changes in the macro-environment, rather than just the micro-environment, of the car and road environment may bring about changes in driver behaviour. As Klein (1976) put it *'just as his (sic) driving may influence an individual's behaviour in other spheres of his life, so, too, his behaviour and experiences in these other spheres may have powerful effects on his driving'* (p.215). It is fairly obvious that both these approaches have merit. The emphasis in this work has been largely that of the 'social perspective', with the macro-environment changes referred to by Klein (*op cit*) being the individual's position in society and/or group and the interaction between the individual and group and/or society in terms of lifestyle or general patterns of behaviour. This level of operation has been broadly termed 'distal social influences' within this thesis (see Chapter 6). Micro-environment changes refer to the more direct interaction between the individual, other road users and immediate social factors, which may influence specific patterns of behaviour which has broadly been termed 'proximal social influences' (see Chapter 7).

Many of the studies reviewed show that some well documented social psychological concepts are applicable to the transportation domain (see also Chapter Introductions). Such studies are interesting from a theoretical point of view and for widening our understanding of driver behaviour. However, there is the very real danger that social psychological research will outline social processes which have an influence on driving behaviour but not attempt to explain how these processes originate or help to develop techniques to modify them when and where appropriate. As Michon (1976) put it we need to not only describe the 'taste of the cake' but also be able to demonstrate 'the recipe' for making it.

Grayson and Noordzij (1990), reviewing the traffic safety literature for the last twenty years, concluded that *'it was the biographical and social factors that proved to be the ones that showed the most consistent (though small) relationships with accidents'* (p.638) and, in a corresponding review of traffic safety work published in the English language, Lester (1991) stated that *'the higher order cognitive and risk perception skills together with attitudinal and social factors are clearly associated with accident liability. Further work in these complex areas, would appear to provide the best prospects of understanding the determinants of driver behaviour and in the long term lead to improved counter-measures and fewer accidents'* (p.18).

A considerable amount of the research reviewed points to the importance of social influences on driver behaviour. Despite criticisms that can be made of the research *'the weight of evidence does suggest that an approach to driving behaviour based on the concepts of social science could lead to important insights that have been neglected to date'* (Knapper and Cropley, 1981, p.213) (see also Section 1.8.1).

1.8 Methodological considerations

An examination of previous methods adopted in driver behavioural research is essential in order to understand why the methods used in this research were chosen. However, results of the studies will not be presented, unless they are specifically relevant, in which case they will be examined in the relevant Chapter Introductions that follow.

1.8.1 Taxonomy of methods

A vast array of different methods have been used to examine driver behaviour. To some extent the choice of method depends on the theoretical stance adopted and the variables to be measured or explored.

There are broadly two types of research design which incorporate a number of different methods within the traffic safety literature. These are retrospective design (the most commonly used) and prospective designs. Retrospective design involves measuring some current variable of an individual (age, sex, experience and so on) and relating this to the accident liability experienced over a number of previous years. Two of the problems which are associated with this design are that the variable which is measured is a current attribute of the individual whereas the accident level is a past attribute. This illustrates one of the other difficulties in that such studies commonly start with the effect (i.e. accident involvement) and then attempt to research back to discover the probable cause. A better design would be to examine the cause and then attempt to predict the effect, which is more the domain of the prospective design. Prospective designs inevitably take more time to complete, are more costly, and are, perhaps as a result, less common (Lester, 1991).

The traditional approach of making deductions about driver behaviour based on accident data has been critically examined earlier (see Section 1.4). However, an additional and very important criticism that can be made of a large number of studies, not only those mainly based on accident data, relates to the actual nature of traffic accidents. Many studies rely on some measure of accident occurrence to determine whether a driver is a 'low' accident driver in order that this group can be compared to a group of 'high' accident drivers. The problem with such an approach concerns the possibility of some random element in accident occurrence. Individuals can become involved in accidents through no fault of their own. Thus, studies which rely on just the accident involvement measure of drivers are likely to have a number of individuals in each of the driver groups who should more properly belong in the other group. Ideally, a number of measures should be used to determine driver behaviour including perhaps, performance measures as well as self-reported accident occurrence.

A number of studies have concentrated on physiological or psychomotor tests (Fergenson, 1971; Barbarik, 1968). Such research tends to be based on the idea that driving can be viewed as predominantly a mechanical skill-based activity. Interest in this approach has declined; one of the reasons being that young drivers tend to score best on psychomotor tasks whilst having the highest levels of accident liability. Colbourn (1978) investigated risk perception and decision making performance of car drivers in a laboratory situation. Few differences between different age and sex groups of drivers were found using estimates of perceived risk. From his review of available literature, Colbourn concluded *'it seems probable that observational studies may reveal more about the effect of driver variables on perceived risk'* (p.140).

Psychomotor tests share with driving simulator studies the characteristic that they take place in a laboratory setting. Experiments that take place in special settings such as laboratories are unreal in the extreme. In reality, social acts take place in their natural environment subject to numerous competing sights and sounds which may determine the interpretive procedures or rule systems of the subjects. The social context of driving is completely removed in a laboratory and subjects probably follow a different behavioural rule-system. This may explain why a number of simulator studies have produced largely disappointing results (Harano, Peck and McBride, 1975; Mihal and Barrett, 1976).

Another commonly used method is observation of driving behaviour. Observation is often referred to as the *'classic method of scientific enquiry'* (Moser and Kalton, 1971, p.244). There are two main types of observation: participant and non-participant. As the name suggests, participant observation involves the observer joining in the life or activities of the group or individual under study. Participant observation normally implies 'covert' observation, with the subjects not aware of being studied; however this would not apply to all such methods in the driving field. Here, the term could encompass in-car observation (Harvey *et al.*, 1975; Quenault and Harvey, 1971; Quimby, 1986, 1988; Quimby and Watts, 1981; Reisser, 1985), sometimes using specially adapted instrumented vehicles to take the place of an observer (Colbourn *et al.*, 1978; Wilson and Greensmith, 1983). The major problem with this kind of observation is that the introduction of an observer may affect the behaviour of the people under study. Non-participant observation techniques such as car following observation (Harvey *et al.*, 1975; Reason *et al.*, 1991); photography of driver behaviour (Evans and Wasielewski, 1982, 1983); or real time human observation (Yinon and Levian, 1988) should have less effect on the behaviour of those being studied, but less detail on performance and driver characteristics can be collected. Observation methods have a number of advantages over methods which rely on reported behaviour because subjects may not be aware of their own behaviour in certain circumstances or may only be able to provide very general information. Furthermore, subjects may have poor memories or be unwilling to admit to particular behaviours. Most of the observational techniques have involved assessing driver performance and their respective merits are discussed in Section 2.2.2.1.

A considerable number of studies have moved from the actual driving environment and used 'pen and paper' methods of data collection. These have most commonly involved the use of questionnaires to elicit demographic data and characteristics of drivers (Harano *et al.*, 1975; Tillmann and Hobbs, 1949) as well as areas such as driver personality (Smith and Kirkham, 1982; Wilson and Greensmith, 1983), perceptual style (Loo, 1978; Mihal and Barrett, 1976), cognitive ability (Quimby *et al.*, 1986; Smith and Kirkham, 1982), driving knowledge (Conley and Smiley, 1976) and attitudes (Guastello and Guastello, 1986; Preston and Harris, 1965; Quimby and Watts, 1981). Research into driver attitudes has been widespread and incorporates attitudes to different types of driving actions or offences (Brown and Copeman, 1975; Reason *et al.*, 1991), attitudes to risk and driver ability (Finn and Bragg, 1986; Matthews and Moran, 1986; Svenson, 1981). With the use of all types of questionnaires, the researcher has to select topics and questions to be answered based on certain value or theoretical judgements they have made. The best way to try and ensure that accurate, worthwhile data are being collected is to build into the research process different stages involving pre-test and pilot studies and to continually modify the research design.

Interview techniques have been used less commonly in the driver behaviour research domain and those have been mainly structured interviews of a quantitative nature (Harrington, 1972; Schuman and Pelz, 1972), rather than in-depth qualitative work (Firth and Geoffery, 1980; Rothe, 1987; Simmonnet, 1991). A possible explanation for this is that qualitative research is viewed as 'less worthy' than quantitative research methods (see Section 1.8.2 for discussion). Structured interviews are of most use in a large sample study where limited information (relatively speaking) is all that is required. Unstructured or semi-structured interviews are to be preferred when exploring complicated topics in detail. However, these types of interview are difficult to conduct, costly and time consuming. Due to these factors, they are normally only used with a small number of respondents when the information that is required is of a qualitative nature (Moser and Kalton, 1971).

In much psychological investigation the experimental design ensures an interaction that becomes a 'social event.' There are social interactions between the experimenter and the subject which can lead to different behaviour patterns being exhibited. Interactions between strangers can progress in a number of ways. If there is supposed to be little chance of future contact then a remarkable degree of openness and candour can be forthcoming. However, a misunderstanding may occur and one person may attribute a certain incorrect persona to the other person. This person might become aware of this and act (and maybe even lie) in an effort of self-presentation to maintain this incorrect picture. Thus there is the danger that results become the products of the method of investigation. As Gergen (1973) put it *'it is the rare social psychologist whose values do not influence the subject of his (sic) research, his methods of observation, or the terms of description'* (p.311). It is hoped that a researcher who is aware of such effects can make an effort to limit such potential difficulties.

Each method has advantages and disadvantages. Laboratory simulators, psychomotor tests, personality tests and structured questionnaires ensure standardisation of the experimental procedure which is less easy with observational or interview studies. The important point to note is that no single method is ideal. Therefore, the use of a multi-method approach might be welcomed.

1.8.2 Methodological design

The planning of any research involves technical and organisational decisions. At an early point, having established the general objectives it is necessary to define the population to be studied, the information required, the method of obtaining this information and how to process and interpret the end results. The research design is based on theoretical and practical considerations, which include the purpose of the study, the required accuracy of results as well as the cost, time and labour involved. The general choice is between intensive or extensive design (Moser and Kalton, 1971).

Intensive design normally involves studying individuals or small groups of people in great detail, whereas extensive design techniques tend to study many members of a group in less detail. Intensive design tends to use more 'qualitative' research methods whilst extensive design favours statistical, 'quantitative' methods. In much traffic safety research, the extensive design seems to be favoured and thought of as somehow more 'scientific' than intensive design.

Due to the small sample sizes, intensive design results can be extended only to the class of cases similar to those under study. Extensive design techniques tend to use statistical methods on many members of a group which tend to eliminate important individual differences within the group under study. This is a serious shortcoming if there are wide variations within the group.

The dominant emphasis on statistical data (and extensive design) in traffic safety research is based on the assumption that the production of an effect is the result of a number of contributing factors. These factors can be separated and varied independently of one another to see their individual contribution to the overall effect. This assumption is only correct if the variable or factor when isolated is identical with the corresponding factor when all the conditions are varying at once. These assumptions are often followed in driver research when the independent variables are taken to be age, sex, experience and exposure. However, human behaviour is not comprised merely of discrete variables logically interrelated and rationally classified; a more comprehensive structure is required. Even if it is argued that the determinants of social action are a structure of internally related variables then the extraction of each variable would change the overall nature of the effect.

There is the danger that a statistical approach which is nomothetic in nature simplifies the problem and makes it appear possible for intervention measures to be prescribed on a calculable basis. With such an approach often the 'social perspective' approach is devalued.

Statistical fallacy is another possible source of experimental error which makes the results of the work misleading. This mistake is revealing in that it would appear to occur in a very large number of published papers (indeed, it is difficult to get results which are not statistically significant published and thus the statistically significant results are likely to stand unopposed and out of context) and can be described as the assimilation of distributively unreliable statistics to distributively reliable. The mistake is that from a particular sub-sample in the population it is inferred that all members of the sample will exhibit the behaviour in question to a certain degree. An example would be the finding that 50% of young drivers drive dangerously in certain circumstances and therefore that the probability of any young driver driving dangerously under the same circumstances is 0.5 (see for example, Broughton, 1988). Such a scenario assumes (most probably incorrectly) that all young drivers have within their behavioural repertoire the action of dangerous driving. Traditional empirical research in driver behaviour consists of gathering the characteristics or behaviour of as large a number of people or instances of the behaviour in question and proceeds to generalise about all instances of the phenomenon under study. It is obviously impossible to study all instances so the average is often used as the best method for achieving some generalisation. Unless there is evidence of all behavioural actions from the entire population, statistical results should not be used to infer that all members of the population will exhibit a particular behaviour under certain circumstances since the results may be distributively unreliable.

Statistical method in psychology should be stringently examined and treated with caution. Replication of work is always advocated but rarely practiced since the work is unlikely to be funded or merit publication. It has been stated by Lang (1844-1912) that some researchers use *'statistics as a drunken man uses lamp posts - for support rather than illumination.'* Statistical jargon must not be mistaken as a substitute for scientific proof. Indeed, Huff (1973) concluded that statistical analysis *'gets by only because the magic of numbers brings about a suspension of commonsense'* (p.138). As statistics are based on the theory of probability, a statistically significant result is likely to emerge in time if a researcher is sufficiently patient and persistent; not forgetting there is always the possibility that statistically significant results can be randomly produced.

Even if some statistical correlation appears robust it is incorrect to infer a straight cause and effect between the two variables. If it can be shown statistically that age is correlated with accident frequency, the question to be asked is, does age cause accidents? The answer is bound to be in the negative or inconclusive because in order to examine the causal relation, the study must move from the collective level to the individual level. The study of suicide statistics is often cited as a topic which has to be studied on an individual basis back to their source in order to determine how they were arrived at and what they actually represent (Douglas 1971). It is easy to accept at face value, statistics produced in reports since they look like 'hard facts' representing the detailed workings of the subject of study. Douglas (1971) stated that it is essential to follow these *'disembodied numbers'* (p.6) back to their sources in order to ascribe meaning to the findings. It could be concluded that statistical results of many studies are ambiguous unless supported by detailed investigation of the individuals who were involved.

This reliance on statistical significance testing sometimes has the consequence of differentiating between those 'worthwhile' research findings and those best forgotten. This emphasis on statistical significance tends to obscure the arbitrary nature of science. Such perceptions can result in researchers not investigating those issues not readily amenable to statistical analysis. The use of statistical analyses as a means of evaluation of research is appealing since statistical tests are seen as objective measures and are highly valued by current research community. It is likely that many journals refrain from publishing statistically non-significant results or replicated studies in favour of statistically significant studies, with little consideration to any problems with research theory, methodology and design that might exist and hence bring into question the overall validity of the work. Statistically significant results are seen as 'fact' or 'truth' but there is no guarantee that quantitative data and analyses are necessarily objective or free from bias. The assumptions, definitions and methods of collection of the data should be scrutinised and the resultant statistics be interpreted in light of this scrutiny. A statistically non-significant result could be interesting and valuable whilst a significant result could be of little consequence (although according to the typical dictionary definition of 'significance' this would be incorrect). As Shaoul (1976) put it *'the research journals contain many articles which purport to show a relationship between a variety of variables and accidents. The superabundance of research at this primitive level suggests that the overall research strategy errs in presenting the mere existence of a statistical relationship (its substantive meaning is never examined)'* (p.341).

A criticism sometimes levelled at qualitative work is that it is a 'subjective' science since it is quite impossible to ensure complete unbiased question wording, but Marsh (1982) calls it *'philosophically naive'* (p.145) to expect this. It must also be borne in mind that, strictly speaking, scientific knowledge can never be fully 'objective' since 'objectivity' can only be based on our own 'subjectivity' (see also Kuhn, 1973).

In addition, relying on large scale statistical designs to some extent dehumanises the subject of study by not providing people with the opportunities to give their own meanings and interpretations to their actions. An example of this occurs with pre-set answers on questionnaires where the person becomes an object to be probed and pigeonholed, not an individual to be co-operated with.

Any investigation which relies only on peoples' external behaviour can miss the determining feature of the activity. Many psychological studies can describe events; for example, young drivers exhibiting risky driving behaviour, but they cannot give a meaningful interpretation of <u>why</u> such events occur. This assignment of meaning has to take place with the location of the object or behaviour surrounded by its pattern of events on an individual and collective level in respect of shared beliefs, goals, norms and so on. The interpretive activity of people involved in any activity is essential for the understanding of the behaviour under study. An example of misinterpretation of peoples' behaviour due to the absence of attention to peoples' interpretations and beliefs was shown by Mixon (1971) where he reworked the famous Stanley Milgram study to show that it was more an experiment about trust, than obedience, as originally conveyed.

Douglas (1971) argued that all science necessarily begins and ends with the 'understanding of everyday life'. Many of those scientists who would overtly oppose interpretative analysis, covertly use common-sense understanding to apply social meanings to the fundamental data that their research theory and perspective produces. Further, Douglas (*op cit*) argued, when writing about social scientists, that *'there is no doubt that almost all of them agree that social actions are meaningful actions, that is, that they must be studied and explained in terms of their own situations and meanings to the actors themselves'* (p.4).

It is important to remember that qualitative approaches which aim at understanding do not lack rigour. It is not a question of making haphazard observations, but rather of being open-minded about the observations which are being made. Research evaluation should be approached without preconceptions about which methods ought to be favoured. Qualitative research analysis is not well formulated, whereas quantitative analysis has well defined guidelines. Any research area should be able to encompass innovative and flexible research methods which are likely, in turn, to encourage further multi-perspective research.

With the use of intensive design it is often best to limit the number of subjects to a clearly defined group (e.g. 'safe' and 'unsafe' young male drivers) so that additional possible variability in a larger population of study does not limit the detail that can be achieved. An intensive design must adopt a fairly flexible approach, so that results can modify any assumptions made as to the attributes and generality of the subjects' behaviour.

In the driver behaviour field, 'social research' is sometimes viewed as 'soft' from the 'human factors' point of view (Klein, 1976). Data collected through interviewing, rather than complicated instrumentation, is sometimes regarded as imprecise and often cannot be statistically analysed. In addition, it is perhaps more difficult to accept that, for example, peer group pressure might be a more influential factor in accident involvement than driver skill or visual acuity. Furthermore, social perspectives often produce long term and difficult solutions to problems, rather than possible solutions which can be implemented immediately such as, (to continue the example), improving driver training or introducing a stricter eye test for drivers.

Klein (1976) concludes that both approaches (human factors and social perspective) are required to reduce traffic injuries, but that *'the current imbalance in the direction of human factors research may be attributable to the belief that this approach promises to save more lives in a shorter time and at lower costs. Certainly the data during the past ten years do very little to justify this belief'* (p.218). Although, this was written some time ago, and the 'social perspective' is, perhaps, being researched to a greater extent than it was then, obstacles to or criticisms of the 'social perspective' approach are still all too prevalent in the driver behaviour research field.

Although it may be the case that quantitative and qualitative methods have been represented as being diametrically opposed, this is not strictly true. It is probably more correct to view them as being on two ends of a continuum. More recently, quantitative and qualitative research methods are being used in the same research domain and researchers are beginning to see the merits of a combined approach. It must also be made clear that qualitative material can be analysed quantitatively. The emphasis in this review has been somewhat biased towards the qualitative end of the research spectrum. This is because quantitative analysis has been predominantly favoured in the driver behaviour field whereas qualitative work has been little tried and there is certainly room within the field for a number of different approaches. It might also be argued that results from qualitative approaches are more readily understood and that policy implications can be more easily formulated as a result of this greater comprehension.

An examination of differences between the German and English approach to traffic safety research is illuminating (Grayson and Noordzij, 1990). A main difference is in the methodology used. The most important component in the German literature is the in-depth personal interview whereas interviews in the English literature are more commonly used, if at all, to supplement the 'objective' test data. It is suggested that this is because English researchers believe the interview to be a 'subjective' and uncontrolled technique. In the German studies, the goal is to understand the person as a whole, not as a unit in a sample. Grayson and Noordzij (*op cit*) stated that *'the German literature is substantial, but the number of empirical studies is limited, whereas the English literature is empirical, but the number of unequivocal results is limited'* (p.640). This is not to emphasise that individuals *per se* should be the unit of study but that characteristics of members of a group or sub-group which predispose the group to have a different accident rate or driving behaviour from another group might provide interesting and fruitful research.

The chosen design approach clearly has to be that most suited to the topic under investigation. This research on driver behaviour has involved differing techniques and methods for collecting data. The methods used are important only in terms of how well they enable the goal of the research to be reached, and are not ends in themselves. Many different methods have been used in driver research including accident statistical studies, driving simulator studies, real life driving observational studies and questionnaire or interview studies (see Ingham, 1991a; 1991b for review). Often an eclectic methodological approach is to be preferred; '..*The extensive design provides one with samples worth studying by intensive methods'* (Harre *et al.*, 1985, p.116). The intensive design used in the second study reported in this thesis was a natural development from the more extensive design adopted in the earlier study. This qualitative approach was adopted because there was a need to understand the differences within the group of young male drivers in as much detail as possible.

The use of these two differing types of method makes an interesting study in itself. However, at the outset of the study, it was not the intention to contrast these two types of psychological research. Over the period of study, new methods have been adopted or adapted in an attempt to examine more fully the same basic problem of young car driver behaviour.

Young car drivers engage in social behaviour. In this context, social refers to the relations and interactions which occur between people, and thus the mere facts about the objective characteristics of individuals explain little of any social significance. Social relations involve the expectations which young drivers have of one another and others, the meanings and interpretations they assign to their own and others' behaviour and the norms that govern that behaviour. There was a need to examine young male driver behaviour, and the explanations the drivers gave for their behaviour, from their own perspectives. In order to achieve such an objective, a qualitative approach was a pre-requisite.

Many of the design perspectives adopted in traffic safety research entail a singular approach. Few attempts have been made to combine a number of different approaches to develop a greater understanding of young driver behaviour working towards an 'holistic' understanding. It is hoped that the combination of different methods and approaches in this work is a step, albeit a small one, towards achieving this goal. The recognition and acceptance of this approach as methodologically valid is a starting point.

1.9 Terminology

The term 'accident' is used in this thesis, despite the problems which are recognised with the term. It has been argued by Langley (1988) that the term 'accident' has suffered from such universal and general use that it should not be used in a scientific context. 'Accident' is used to describe crashes in all four transport systems (road, rail, air and sea) as well as in other contexts. Nevertheless, each of these different systems uses different technology, makes different demands on human operators and results in different accidents often due to different causes. The fact that the term 'accident' is used to describe such different events may illustrate our lack of understanding of the phenomena.

The use of the term 'accident' suggests that crashes occur as the result of bad luck, fate or chance; the term involves an implicit explanation of why the crash occurred. In addition, some proportion of 'accidents' are purposeful events, such as suicides where the term 'accident' is self-evidently inappropriate (Langley, 1988).

The term 'accident' should be used consistently in order to have meaning. In this thesis, the term accident will be used to mean an unexpected, not necessarily injurious or damaging event, in which an automobile is being driven; which was invariably preceded by an unsafe driving act or an unsafe condition or some combination of both.

Inconsistent uses of age bands when dealing with driver age as well as difficulties with definitions of driver experience and exposure have been mentioned (Section 1.3.1). Such terms used in this thesis are made explicit within the text.

The use of the broad term 'error', most commonly to describe any inappropriate driver action has been avoided in the knowledge of work by Reason *et al.* (1989) where they give the definition of driver error to be the *'failure of planned actions to achieve their intended consequences'* (p.1-2). A distinction is thus made with violations which are seen as *'deliberate deviations from those practices believed necessary to maintain the safe operation of a potentially hazardous system'* (p.2). To avoid possible confusion, studies which have not taken account of this distinction have been altered so that 'unsafe driver actions' (UDAs) replace the use of the term 'error'.

1.10 Literature summary

It would seem that traffic accidents are a major problem and can be viewed as 'social events' explained in terms of a social and cultural perspective, in addition to the 'human factor' (e.g. age, experience, exposure, personality, cognitive variables and so on) perspective.

Understanding of driver behaviour, especially young male driver behaviour, must be studied in the context of the situations and meanings which the young drivers themselves prescribe. In order to achieve this, a multi-method approach is favoured combining both (so-called) quantitative and qualitative methodological approaches.

2 METHODS

2.1 Introduction

The broad aim of this work was to explore a number of factors, predominantly social, which might help to explain young drivers' (less than 25 years) over-representation in the accident statistics and, in turn, develop a greater in-depth understanding of young male driving behaviour. In order to do this two studies were conducted. Study I was devised to obtain a number of measures of driver performance, driver patterns and driver attitudes and opinions across a range of age and sex groups; in essence, to examine inter-group age and sex driver differences. Results revealed inter-group variation, but also showed that intra-group differences, particularly evident in the younger male groups, were not taken account of. This formed the basis for Study II, namely that all young male drivers are not the same and cannot be treated as one homogeneous group, as they often have been in much previous research. Due to the design of Study I, there was a well-defined group of young male drivers classified as either 'safe' or 'unsafe' drivers (based on observed performance measures and reported accident histories) who could form the sample base in Study II. The main aim of Study II was to examine any intra-group differences in this younger male driver group.

For the sake of clarity, the two studies will be described separately. However, it must be continually borne in mind that Study II was a continuation of the first and used a sub-sample of drivers from Study I, chosen as a direct result of findings in this earlier study.

One criticism of some work in psychology has been termed by Harre *et al.* (1985) 'universalism', that is, the tendency to over-generalise results of one group to all of personkind. The treatment of all young drivers as one homogeneous group could be a small example of this. This work and the findings reported do not make any claims to be true of the entire population of drivers in this country. The aim of most work is to obtain a sample fully representative of whichever particular group is being studied. However, practical difficulties (most commonly time and cost) ensure this is rarely attainable. To this end, the sample selection procedures, methods, results (and shortcomings) of the work are described in detail.

2.2 Study I: Behavioural aspects of younger drivers

2.2.1 Sample characteristics

439 subjects took part in Study I in three age groups; 17-20 years, 21-25 years and 31-40 years (inclusive). The younger and older groups were chosen since they represent the extreme range of behavioural differences. The 17-20 year age group is known to have the highest driver casualty rate (6.9 per 100,000 population) and those in the 31-40 year old group one of the lowest (2.8 per 100,000 population) (Department of Transport, 1991). It was expected that a number of drivers in the middle age range (21-25 years) whilst of similar age, would have quite varying levels of driving experience thus enabling the possible effect of experience within age group to be studied. A structured sample, rather than a representative sample of the entire driving population, was required to facilitate comparisons across age and sex groups. Therefore, deliberate quotas were set for the different age and sex groups and certain subjects were excluded if they did not fit the required sample characteristics. Learner drivers were not included in the study.

Initially, the sample was chosen from the local electoral register of a number of mixed SEG (socio-economic group) wards using a systematic sampling technique of selecting every *n*th name. Since the systematic arrangement of the list was not related to the subject of study (ie car driving), this technique can be called 'quasi-random sampling' (Moser and Kalton, 1971). Young people who will be eligible to vote at the next election are included on the register along with their birth date enabling a large list of potential young drivers to be produced.

The people selected from the register were sent a simple letter briefly outlining the research and asking them to volunteer to participate in the study if they fitted into any of the age categories of drivers required. A follow up letter was sent as a reminder to those who did not reply initially. The letters asked respondents for basic demographic information and from the replies the appropriately matched categories of drivers were selected. Any potential source of bias, such as SEG bias, was identified and eliminated wherever possible. Unfortunately, this method suffered from a large percentage of non-response and allied to the fact that many people who were contacted were not eligible (not in the required age bands or non-drivers) ensured that other methods for obtaining the sample were instigated.

Such methods included advertising in local papers and displaying posters in local firms, schools and colleges. Direct contact was also made with company personnel officers for permission to use 'in-house' magazines or direct memos for recruitment. The so-called 'snowball' effect, whereby volunteers persuaded friends and colleagues to participate, also proved useful.

A recruitment agency was later engaged to help with the difficult task of obtaining sufficient subjects for the study. The general difficulty of obtaining subjects, particularly in the younger age groups, meant that a number of different approaches were used to obtain the final sample. In addition, as an inducement to take part and complete all parts of the study, a payment (£25) was made to subjects. It is recognised that the use of such methods is far from ideal. Nevertheless, it should be noted that willing subjects were excluded from the study if they did not fit the characteristics of the sample or if the relevant category was already full. The final sample was subjected to a number of post-selection checks (see below) in order to ensure that it was as unbiased as was feasible.

All subjects were expected to complete the three components of the study; the route survey (to assess driver performance), the driving diary (to determine driving patterns) and the questionnaire (to determine driver attitude and opinion). A total of 439 route surveys were conducted with 19 subjects failing to complete their diary and 9 subjects who did not fill in a questionnaire (Table 2.1).

Table 2.1: Sample and completed data

Completeness of sample	Male 17-20	21-25	31-40	Female 17-20	21-25	31-40	Total
Fully complete	78	72	75	57	48	81	411
Missing diaries	7	3	4	4	-	1	19
Missing background							9
OVERALL	85	75	79	61	48	82	439

The percentage of drivers in each socio-economic group (S.E.G.) was examined by age and sex (Table 2.2). S.E.G.'s were defined using the Registrar General's Classification (1-10) used for the General Household survey.

Table 2.2: Socio-economic groupings (%) by age and sex

Socio-economic group*	Male 17-20	21-25	31-40	Female 17-20	21-25	31-40	Total (%)
Non-manual (1-3)	12	41	65	30	46	56	41
Manual (4-6)	21	35	32	27	42	21	29
Students (7)	65	21	2	42	8	-	24
House keepers (8)	-	-	-	1	4	18	4
Unemployed (10)	2	3	1	1	-	5	2
TOTAL	100	100	100	100	100	100	100

The numbers in brackets are the Registrar General's classification from 1-10 for the General Household Survey. S.E.G. (9)= retired, of which there were none.

Of the 102 drivers categorised as students less than 15% of these were University students. The majority were from schools, sixth form and technical colleges in the surrounding area.

Care was taken not to get a preponderance of unemployed as a result of the financial inducements given to participate in the study. SEG figures were compared with those of the 1987 General Household survey (Table 2.3). The annual General Household Survey provided the SEG of adults but not broken down into age bands. Therefore, the overall total percentages, using the same SEG definitions, were compared (from General Household Survey 1987 (1989)).

The results would not be expected to be identical given the precise age criteria selections within our sample. The main differences between our sample and the national SEG figures was that there was a much higher percentage of students (people in full-time education) in our sample and a higher percentage of retired persons within the national SEG figures (this was due to the selection of 66% of our sample from the 17-25 year old age groups). If only the manual and non-manual group totals are selected from both samples, it becomes evident that the comparative percentage figures are very similar (Table 2.3).

Table 2.3: Manual and non-manual comparison (%) between General Household Survey (1987) and study sample.

	Non-manual	Manual	Total
General Household Survey (%)	56	44	100
Study sample (%)	59	41	100

It would appear that a reasonable S.E.G. spread across all categories, but particularly the non-manual/manual distinction, was obtained. This was essential in order to eliminate any possible effects from an S.E.G. bias.

Two measures of driving experience were used: total career mileage (an estimate based on extrapolation from the last five years reported mileage) and number of years of driving since passing the test. Levels of driving experience overlapped between as well as within age group. Quite wide variations of experience, both in terms of career mileage and number of years since passing the test were obtained across all age and sex categories. Table 2.4 shows the minimum, maximum and average values for both types of experience measures across age and sex groups. As mentioned previously (Section 1.3.1), age and experience variables are confounded since experience levels (career miles) increase with age, but at a different rate for male and female groups.

Table 2.4: Driving experience measures by age and sex.

Driving experience (career miles)	Male 17-20	Male 21-25	Male 31-40	Female 17-20	Female 21-25	Female 31-40
Minimum (1000's)	0.3	3	22	0.2	0.7	3
Maximum	62	169	999	47	116	346
Mean	15	49	233	11	37	97
Years of driving						
Minimum	0.1	0.3	5	0.1	0.3	2
Maximum	4	9	24	4	8	24
Mean	2	5	15	2	4	13

2.2.2 The route surveys

An assessment of drivers' performance on a specially selected route was necessary to identify specific driver skills, problems and UDAs (Unsafe Driver Actions - see Appendix A.2.1) related to age, experience and other characteristics.

2.2.2.1 Previous studies using direct observation of driving

It seems obvious that in order to determine factors which contribute to accident involvement, driver performance should be examined. However, studies have produced ambivalent results as to the value of performance testing as an accurate predictor of accident involvement. For example, Sheppard *et al.* (1973) found no association between minor faults when passing the test and subsequent accidents; and Jones (1978) cited in Lester (1991), testing novice drivers, found a low test-retest reliability measure. The argument presented was that if the performance test could not predict future performance on the <u>same</u> test, it was unlikely to be predictive of <u>future</u> accidents. In addition, Quenault and Harvey (1971) could not distinguish between accident free and accident involved drivers based on any of their performance measures (although they did distinguish between groups of drivers with and without convictions). Some of the difficulties with performance testing are the degree of accuracy required to measure performance, what should be measured and how it should be measured.

There have been many different approaches used to measure driver performance ranging from the use of instrumented vehicles and simulators through to 'car following' observation to 'in-car' observation. Given the highly artificial nature of some of the studies, it may not be totally surprising that no correlation was found between recorded measures and accident records. However, a number of studies have shown some evidence for a relation between performance measures and accidents and these will be presented along with problems and difficulties with such studies.

Harvey, Jenkins and Sumner (1975) investigated driver performance to find out which were the most common and most dangerous UDAs (Unsafe Driver Actions), and the locations at which they occurred. Three methods of data collection were tried, including 'in-car' observation, 'following-car' video observation and 'time-lapse' observation. With the 'in-car' method of observation, drivers had to drive their own car around a pre-determined route of 28 miles, accompanied by an observer who sat in the front passenger seat. The 28 mile route included as many locations as possible where injury accidents had been known to have occurred in the past and as many different road types as possible, with the exception of motorways.

Standardisation of UDA definition and severity measure was consistent over all three methods of collection and depended upon traffic situation at the time of the observation. A comparison was made between the number of UDAs observed per mile for drivers with observers in the car and for unaware drivers with observers in a following car. It was shown that the presence of an observer did appear to have an effect on driver behaviour in that fewer and less severe UDAs were observed. The validity of the UDAs as measures of dangerous driving behaviour was demonstrated by significant correlations between the number of UDAs, their level of danger and previously established and subsequent accident occurrence on the set route. However, there was no evidence presented to show a relationship between the individual performance and individual accident record, despite this information being collected. These points are important as it has been claimed that improper driving has not been demonstrated to occur more frequently as a causal factor among accident involved drivers than among those not involved (Shaoul, 1976). Nevertheless, Harvey *et al.* (*op cit*) concluded that the measurement of driver performance was possible using any of the three methods outlined and further, proposed that in-car observation would be *'a useful technique for comparing the performance of specific groups of drivers (e.g. different age groups)'* (p.29).

Two obvious advantages of the 'in-car' method of observation are that certain UDAs can only be observed in this way (although normally the more minor errors) and that the need to contact people directly to participate in the research ensures that there is no difficulty obtaining additional personal and demographic data which are often required.

Reason *et al.* (1991) report on an *'in-car' observation study* (p.34) (which using the terms above would strictly be called a 'car-following' study) where two researchers in a car followed 'target' cars (N=244) for about 4 minutes on a major urban road, recording any driver actions considered to be illegal (ie in breach of the Highway Code) or simply discourteous. This method also appeared to be a reasonable method of assessing certain driving behaviours (especially since drivers were unaware of being observed). However, the more minor UDAs and precise characteristics of drivers and passengers (ie age, driving experience) could only be estimated or left unrecorded.

Reisser (1985) using an in-car 'test' drive method found a relation between total UDAs and accident history. However, this relationship was not found to be independent of age and experience factors of the driver and therefore did not distinguish between accident involved and accident free drivers with similar age and experience levels.

Quimby (1988) developed a classification system of UDAs which incorporated both the frequency of occurrence of different types of UDAs and the type of situation in which they occurred, either 'normal' (everyday) or 'conflict' (near accident). This detail was needed in order to assess the relative risk of the different behaviours or their likely contributions to accidents. One of the problems with 'in-car' observation is that it is time consuming and therefore it is often necessary to use a fairly small sample of subjects. In fact, Quimby (*op cit*) used only 48 subjects, some of whom had previously acted as experimental subjects in other studies.

Previous research and accident statistics show that age and/or driving experience and sex are important variables in influencing driver performance (Moore *et al.*, 1982; Storie, 1977; Broughton, 1988). As a result, Quimby (1988) selected four groups of subjects comprising older and younger males and older and younger female groups. However, the demographic data collected on the chosen subjects showed that younger females had well under half the driving experience of younger males (1.8 years for females compared to 4.2 years for the males) and there appeared to have been no checks to see whether or not the sample was representative of the driving population as a whole.

Even if a sample representative of the general driving population is used, it cannot be assumed that their driving behaviour in the study is representative of their own 'normal' driving behaviour or of other similar drivers in 'everyday' conditions (Quimby, 1988). The main reason for this is that the presence of an observer in the experimental situation may alter the subject's normal driving behaviour. One of the ways to attempt to reduce this is to give the subject a suitably convincing subsidiary task to perform during the drive. This may make the drive more realistic of normal driving behaviour since drivers cannot fully concentrate their attention on the driving. Clearly, however, there is the danger that any subsidiary task, if too difficult, may itself influence the subject's driving behaviour.

Another point frequently raised as an objection to the validity of the 'in-car' observation concerns whether or not the measure being used for observing car driving behaviour, in this case, UDAs, is adequate as a measure of driving performance since there are no accidents observed. There are two schools of thought on this issue. The first is that UDAs are indicative of accident conflicts at particular sites (Harvey *et al.*, 1975) and of individual drivers (Quimby and Watts, 1981), whilst the second is that even accidents themselves are not good predictors of accidents at a particular site (Williams, 1981) or for individual drivers (Hakkinen, 1958, cited in Quimby, 1988). Despite these conflicting views, Quimby (1988) using an 'in-car' observation methodology concluded, *'it is clear from the results obtained that the technique employed in this feasibility study provided a suitable way of learning more about the role of faulty driving behaviour in road accidents'* (p.17).

After examining the various options available for assessing driver performance, an 'in-car' observation technique was chosen for the present study in the manner of Quimby (1988).

2.2.2.2 Summary of task

All subjects drove their cars around a pre-determined 40 km route. Prior to the drive, subjects were given instructions to describe anything on the route which they felt might be dangerous to themselves or other road users. This subsidiary task was introduced to make the subject less aware that their driving was being assessed. All drives were conducted between June 1989 and June 1990. The drives started and finished at the University and took place at a variety of different times between 8am and 9pm on weekdays or Saturdays.

During the drive, the subject was accompanied by a front seat passenger who gave route directions (the 'route director') and a rear seat passenger (the 'observer') who, it was stated, was there to record comments of the driver and conditions on the road, but who was actually assessing driver behaviour using a specially designed route assessment marking procedure (see Appendix A.1).

Conversation from the route director was kept to a minimum unless initiated by the driver. The observer in the rear seat behind the front passenger (to facilitate recording of 'mirror' work) made few comments during or after the drive in order to remain as inconspicuous as possible. Subjects were unaware that rear seat passengers were highly qualified driving instructors (police or civilian) and the observers had no idea who the subjects were, other than identifying them by their forenames. This meant that nothing said or performed during the drive could have any repercussions for subjects or the observers. All of the observers were male.

A procedure to curtail the route survey was developed for those drivers who were so unsafe that the observer felt it was hazardous to continue with the entire drive. 2% of drives (n=9) were shortened in this way.

2.2.2.3 Choice of route

The route was chosen in collaboration with Hampshire Police Driver Training School guided by the need to include as many different road types, junction types and environments as possible in both rural and urban areas. A map of the route is shown in Figure 2.1. As many as 272 injury accidents were reported on the 40 km route during the previous three and a half years (1987, 1988, 1989 and up to the summer of 1990), an accident here being classified as one involving injury, reported and recorded by Hampshire police and where the vehicle or vehicles involved were travelling in the direction of the route.

The numbers of different manoeuvres on the route are shown in Table 2.5. The total length of road measured for the speed limit sections was slightly less than 40 km because all turns and roundabout manoeuvres were not included in the measures.

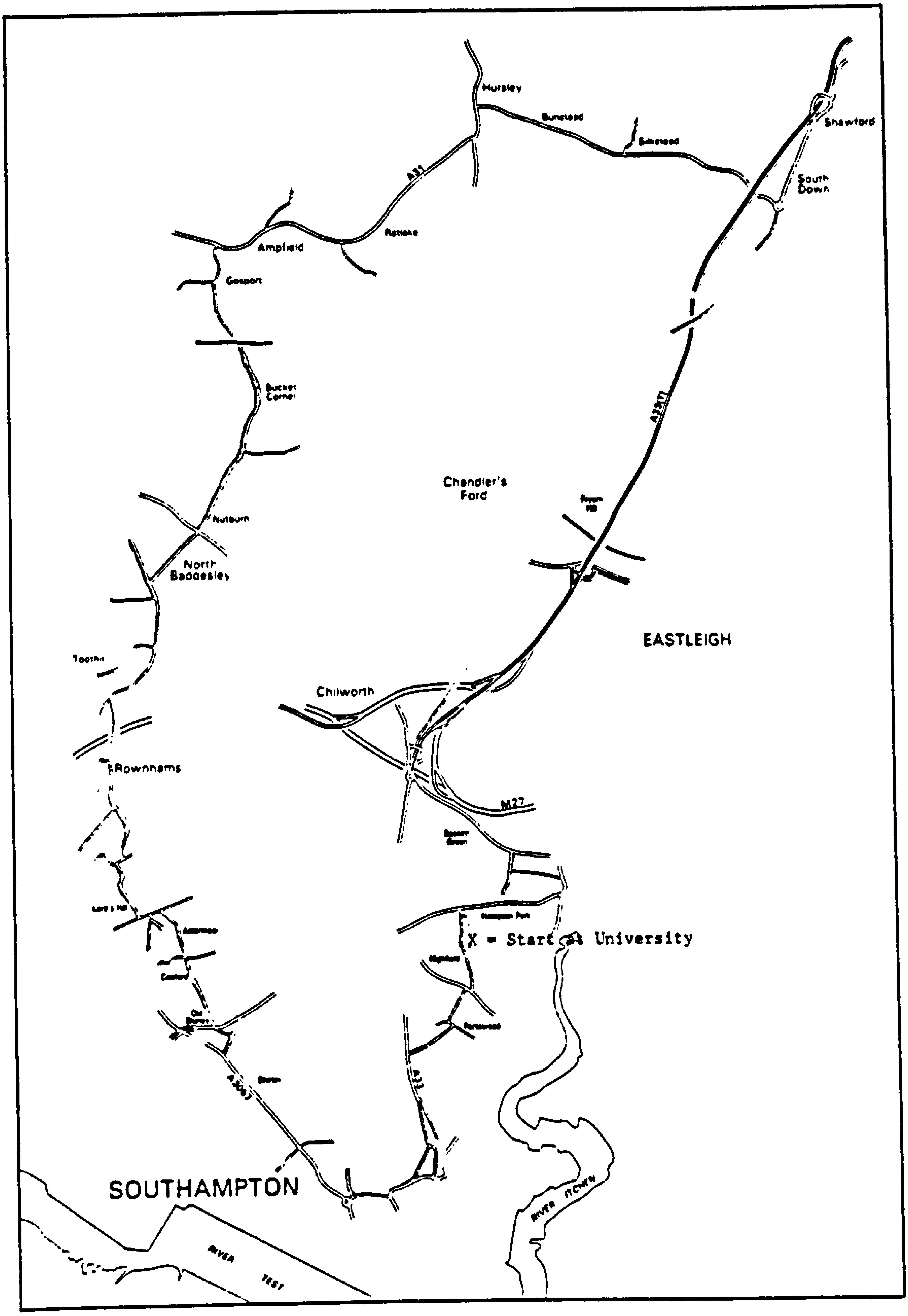


Figure 2.1: Map of route

Table 2.5: Characteristics of route

Route characteristic (maximum speed limit)		Length of road (kms)	
30 mile/h - in shopping / residential area		3.6 / 7.6	
40 mile/h		4.6	
50 mile/h		9.3	
60 mile/h		11.7	
Road characteristic	Number of manoeuvre Sections Major to minor		Minor to major
Right turn -	3		6
Left turn -	4		5
	Right turn	Left turn	Ahead
Roundabout	3	2	0
Traffic lights	1	5	11
Pedestrian crossing	N/A	N/A	6

2.2.2.4 Choice of observers

The observers who assessed driver performance were highly experienced driving instructors or examiners. All the observers were given sufficient training time to familiarise themselves with the route and UDA marking procedure. A number of drives took place to improve and refine the measurement of driver performance. A series of test runs, using the same four 'volunteer' drivers, were undertaken in order to evaluate the consistency of the observers' marking.

2.2.2.5 The observers' task

Prior to the drive, observers filled in a record sheet containing basic details about the drive including date, time at start, make and model of car and weather conditions. Driver performance was assessed by the observers who marked UDAs by location on the route using the specially designed recording sheet. There were 12 UDA types to record in addition to speeding UDAs which were itemised (see Appendix A.2.1 for UDA definitions). If an UDA was considered dangerous it was circled on the route map. Observers also had to record road conditions on each identifiable section on the route in order to ensure that this could be taken into account in the subsequent analyses.

At the completion of each drive observers made an overall assessment of driver performance and assessed whether or not each driver reached Department of Transport driving test standard in respect to the driving performance they displayed on the 40 km route.

2.2.2.6 Overall ratings by observers and drivers

Immediately after the drive, drivers were given a self-completion questionnaire and asked to assess their own driving performance on a number of different criteria. These included assessments on their own driving ability, safety, anticipation, concentration, observation and car control (see Appendix A.2.2 for definitions and Appendix A.3 for copy of post route questionnaire). This was administered and collected by the route director. At the same time, the observers made their own assessments on identical measures. This procedure ensured that direct comparisons could be made between self-assessed and observed scores for each driver's performance.

2.2.3 The driving diaries

The use of driving diaries enabled a record of driving patterns to be drawn. These driving patterns could be related to basic demographic and other information such as driving experience and exposure, involvements in accidents, general lifestyle characteristics, as well as the assessments of driver behaviour. Such data were also useful in enabling more precise estimates of relative exposure at different times of day and days of week.

2.2.3.1 Design and completion

The diaries were designed to include every journey undertaken in the specified time period. Initially, subjects were asked to record two weeks of journeys but this was later reduced to one week due to the time consuming nature of the task. Prior to completing the task, subjects were asked to fill in the diary during a 'typical' week's driving. Each journey was entered and some standard information obtained including source and destination, time, distance, purpose of journey, details of passengers and some scales reflecting the driver's perception of the journey (for example, enjoyable, tense, hurried) (see Appendix A.4).

Only 6% of subjects did not return their completed diary. These subjects did not appear to be significantly different in any of the measured characteristics from the rest of the sample. The reported number of journeys that were not recorded by the subjects in the specified one or two week period was extremely low, although it was difficult to know whether such self-reported estimates were accurate. It is likely that subjects underestimated the number of journeys that they actually forgot to fill in. However, there are no strong grounds for suggesting that the 'missing' journeys differed significantly from those reported, although it is perhaps more likely that the journeys not recorded were the shorter ones. Originally, car mileometers were checked at the start of the diary period and after completion of the diary. It was thought this would provide a check of the number of 'missing' miles during the diary week. However, this check could not take account of the fact that many of the cars were driven by more than one driver during the course of the diary week.

2.2.4 Questionnaires and interviews

The interviews and questionnaires were essential to determine driver attitude. Findings were then related to driver performance and driving patterns determined from the diaries, thus completing a picture of individual driver behaviour.

2.2.4.1 Summary of interview procedure

Initially, 68 drivers drawn from the three age groups were interviewed in order to determine their general characteristics and attitudes to driving. The interviews ranged in length from forty-five minutes to one and a half hours and included discussions about driving habits, experience, lifestyle, drink driving, car choice, possible effects of passengers, radio cassette use, accident history, motoring offences as well as attitudes to other drivers and provisional ('P') plates for novice drivers. All interviews were tape recorded for subsequent transcription and the majority took place at subjects' homes.

A semi-structured interview format was used as it is often effective in encouraging respondents to give accurate and honest answers. Particular emphasis was placed on trying to avoid getting 'socially acceptable' responses.

2.2.4.2 Choice of key areas for questionnaire

Later, the interview component was replaced by a self-completion questionnaire which focused on the main findings from the interviews (see Appendix A.5 for copy of questionnaire). The use of the questionnaire enabled larger amounts of data to be collected from a larger sample of drivers in a shorter time period.

2.2.5 Accident statistics

Details of each reported injury accident occurring along the route in the previous three and a half years (1987, 1988, 1989 and up to summer 1990) involving a vehicle travelling in the same direction as the route survey, were obtained through Southampton City Council and Hampshire County Council. These accident data were classified by the route sections in which they occurred so that comparison could be made with the observed driving UDAs by section.

3 DRIVER PERFORMANCE, PATTERNS, ATTITUDES AND OPINIONS

3.1 Introduction

The main objective of Study I was to identify those aspects of driver performance, attitudes and behaviour that relate to accident involvement, using comparative groups of young (17-25 years) and older drivers (31-40 years) with differing amounts of driving experience. In order to do this some measures had to be taken of driver performance, attitude and behavioural patterns. Three different methods were devised in order to do this, which are outlined above (Chapter 2).

An accurate measure of driver performance, attitude and driving patterns is essential since there are grounds for believing that they influence driving behaviour differently. Full coverage and analysis of these three areas, using a multi-method approach, is likely to be the first step in providing a comprehensive picture of driver behaviour. A detailed driver performance measure was essential to explore skill-based explanations of driver behaviour, an analysis of driving patterns was essential to investigate exposure patterns and an investigation of attitudes and opinions to driving was required to explore some of the more social areas of driving, such as passenger effects, which are not readily studied in other ways. The last two measures, driver patterns and driver attitudes and opinions, were closely related in that driver patterns could determine the amount (occurrence) of particular behaviours (for example, passenger presence) with driver attitude helping to determine the size of the effect. The two latter measures had to be looked at in combination in order to gauge the full effect.

The degree of closeness to which two variables are related in a simple linear manner is measured by means of the correlation coefficient between the two variables. Correlations between some of the more important variables of different types were made and these are reported in the appropriate sections which follow (see Appendix A.7 for correlation matrix tables). Within the study, the four possible dependent variable measures were:

(i) annual accident frequency ie the number of accidents in the driver's history, divided by the number of years of driving (NACY = number of accidents per year)

(ii) annual 'at fault' accident frequency ie the number of accidents in the driver's history which were the fault of the driver, divided by the number of years of driving (NFAY = number of 'at fault' accidents per year)

(iii) total number of UDAs (Unsafe Driver Actions (see Appendix A.2 for definition) observed on the route survey

(iv) total number of dangerous UDAs observed on the route survey

Although multivariate regression analyses were conducted across all the dependent measures, results are only fully reported on the 'at fault' accident frequency measure. The 'at fault' accident frequency was chosen because the multivariate analysis model was the best fitting accounting for 92% of the explainable variation.

3.2 Driver performance

The most involved task was to design an accurate method of assessing driver performance. Due to reasons outlined above, an 'in-car' observation method involving route surveys was favoured (see Section 2.2.2.1).

As noted above, weather, road and lighting conditions were recorded on each route survey in order to control for any effect these might have on driver behaviour. Over 58% of the route surveys took place during fine, sunny weather in daylight hours on dry roads. A further 22% of the route surveys took place during daylight on dry roads when it was overcast. The remaining 20% (N=86) of the route surveys took place in conditions when at least one of the other measured conditions (rain, dusk, darkness or wet roads or any combination of these) was recorded.

Those route surveys that were conducted during unfavourable driving conditions were fairly evenly spread across all age and sex categories, the largest difference between the categories being only 9 route surveys. The small numbers of subjects in each category undergoing the route survey in adverse weather meant that any conclusions drawn on the possible effects of weather on driver behaviour would be unreliable. It would seem unlikely that the weather conditions experienced on the drives played any significant part in driving performance on the route. In any case, the driving observers were instructed to take account of driving performance in relation to weather conditions.

Checks on the accuracy and consistency of the marking procedure across observers were examined. The distribution of observers' scores indicated that any weighting of scores was unnecessary.

3.2.1 UDAs by age and sex

The average number of driver UDAs for each age and sex category showed that males aged 17-20 years made the most with 95 UDAs per driver. For the male groups, average number of UDAs fell dramatically and consistently as age range increased. No such pattern was evident from the female scores and average number of UDAs remained fairly high at over 80 UDAs per drive for all the female age groups. Steering UDAs comprised about a third of all driver UDAs whilst speeding UDAs comprised around a fifth to a quarter of all types of UDA.

The average number of UDAs per driver of each type of driver UDA and the percentage of the overall number of UDAs by age and sex category is shown in Table 3.1.

The average number of UDAs committed reflects to some extent the opportunity for committing such UDAs. For example, there were more occasions to commit steering UDAs on the route than joining traffic UDAs. Therefore, the comparison between UDA types is not as valid as the comparison between age and sex groups within UDA type.

Table 3.1: UDAs by type by age and sex.

UDA type	Male 17-20 Ave	(%)	Male 21-25 Ave	(%)	Male 31-40 Ave	(%)	Female 17-20 Ave	(%)	Female 21-25 Ave	(%)	Female 31-40 Ave	(%)
1	3.5	(4)	2.7	(3)	2.4	(4)	3.8	(4)	4.2	(5)	5.1	(6)
2	32.1	(34)	25.9	(33)	16.6	(29)	29.0	(33)	26.5	(32)	27.4	(33)
3	4.8	(5)	2.9	(4)	3.0	(5)	4.6	(5)	4.7	(6)	4.7	(6)
4	13.9	(15)	10.5	(14)	8.3	(14)	11.5	(13)	8.1	(10)	9.5	(12)
5	1.9	(2)	2.7	(3)	2.6	(5)	1.9	(2)	3.4	(4)	3.3	(4)
6	9.0	(9)	9.1	(12)	7.2	(13)	9.1	(11)	10.8	(13)	10.3	(13)
7	3.2	(3)	3.5	(4)	2.2	(4)	4.8	(5)	3.8	(5)	3.5	(4)
8	0.6	(1)	0.3	(-)	0.6	(1)	0.5	(1)	0.3	(0)	0.5	(1)
9	-	-	-	-	-	-	-	-	-	-	-	-
10	0.8	(1)	0.7	(1)	1.0	(2)	1.0	(1)	1.5	(2)	1.3	(2)
11	1.6	(2)	0.7	(1)	1.0	(2)	0.8	(1)	0.7	(1)	0.9	(1)
12	1.2	(1)	0.6	(1)	0.7	(1)	0.9	(1)	1.4	(2)	1.1	(1)
13	-	-	-	-	-	-	0.2	(-)	-	-	-	
14	22.0	(23)	18.2	(24)	11.4	(20)	19.9	(23)	16.0	(20)	13.7	(17)
Total	95	(100)	78	(100)	57	(100)	88	(100)	81	(100)	81	(100)

% = rounded up to make 100%

KEY TO UDA TYPE:

1= Brakes	8= Joining traffic
2= Steering	9= Leaving traffic
3= Gears	10= Overtaking
4= Mirrors	11= Erratic manoeuvres
5= Indicators	12= Consideration to other road users
6= Position on road	13= Slow speed
7= Following traffic	14= Speed UDAs (too fast)

The types of UDAs with the highest average scores (steering, mirror positioning on road and speeding) per driver by age and sex are shown in Figures 3.1 to 3.4. Some of the differences in the number of different and total UDAs between the driver age and sex categories were significant using ANOVA (see Appendix A.6).

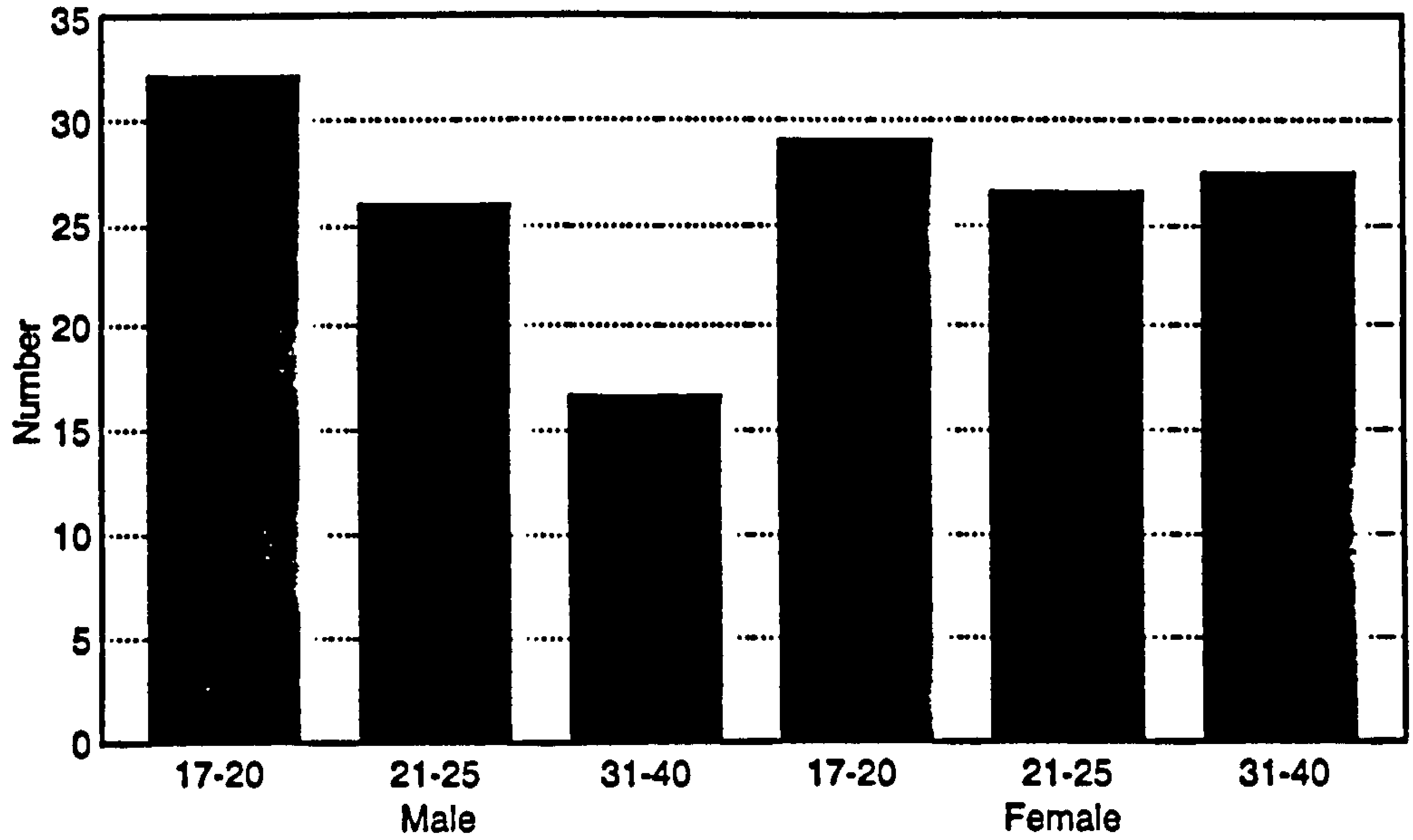


Figure 3.1: Steering UDAs (average) per driver

The number of steering UDAs for the male groups decreased as age increased whereas female steering UDAs remained at a consistent level. An ANOVA revealed that age and sex were not significant on their own, but the age/sex interaction was at the 5% level (see Appendix A.6).

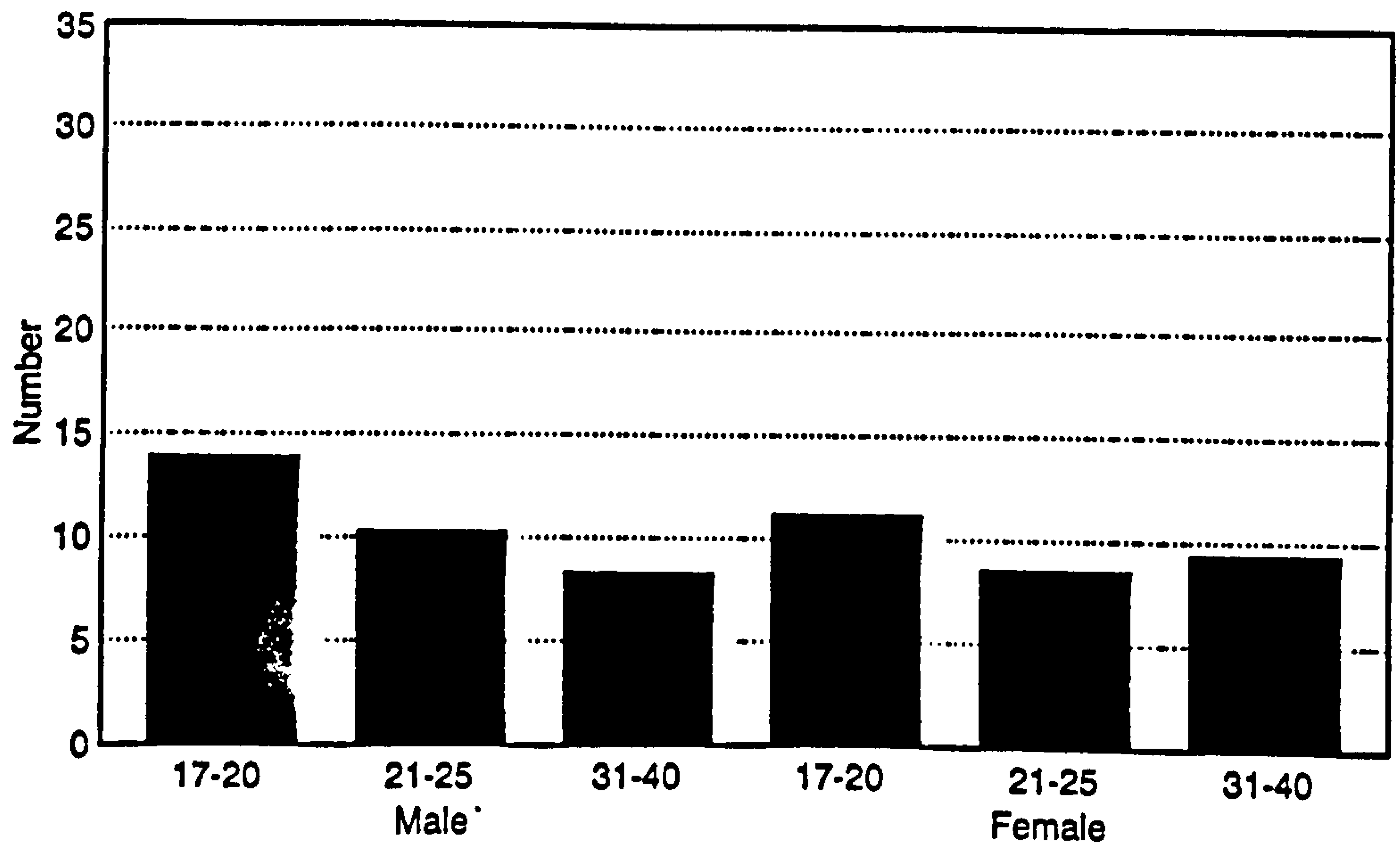


Figure 3.2: Mirror UDAs (average) per driver

Mirror UDAs for the male drivers decreased as age increased. This pattern was not so marked with the female groups. An ANOVA showed that only the age group effect was significant at the 5% level (see Appendix A.6).

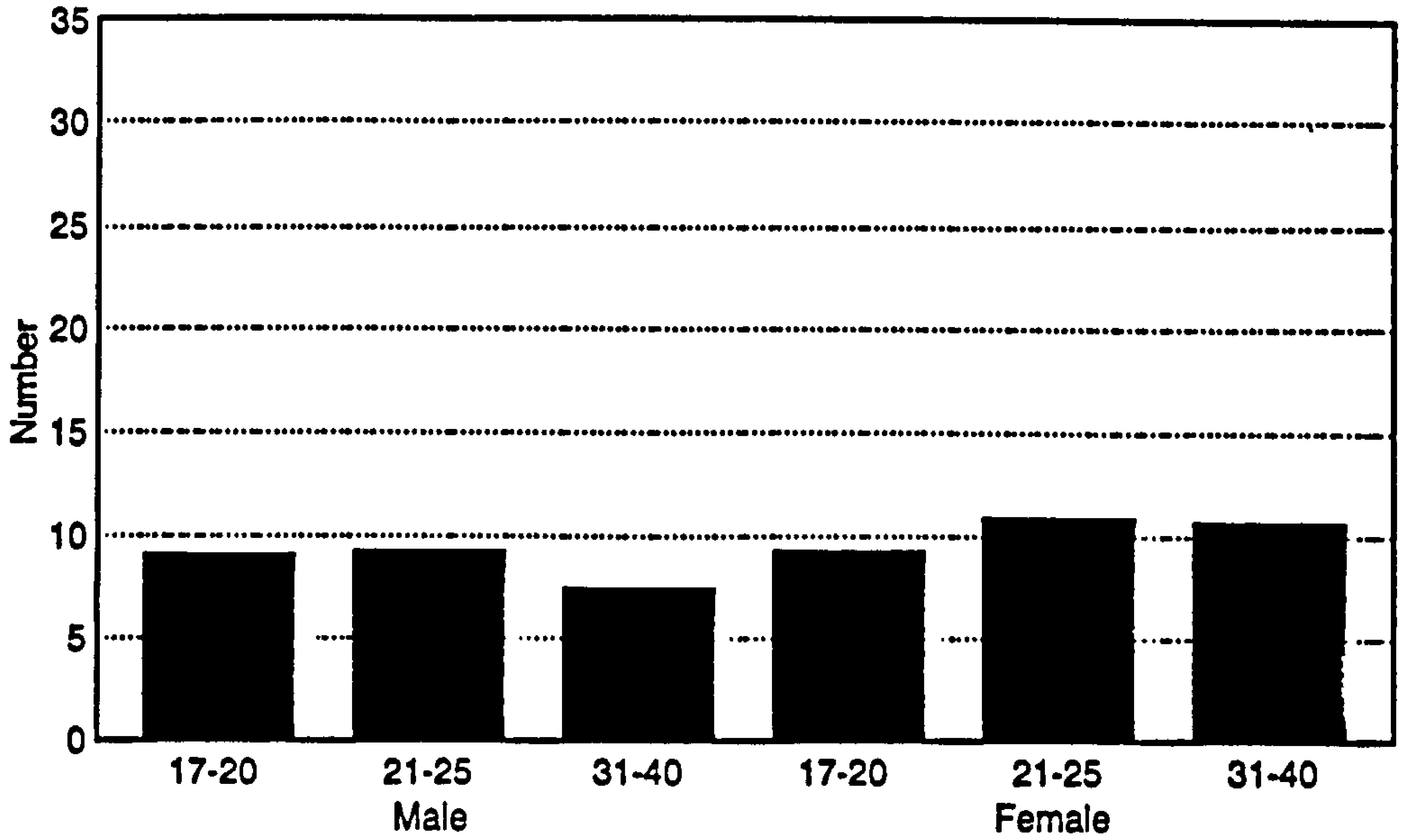


Figure 3.3: Positioning UDAs (average) per driver

For the male groups, the number of positioning UDAs committed on the drive decreased slightly as age increased whereas for the female drivers the number of UDAs remained about the same across age. An ANOVA showed that neither the age nor sex nor age/sex interactions were significant at the 5% significance level (see Appendix A.6).

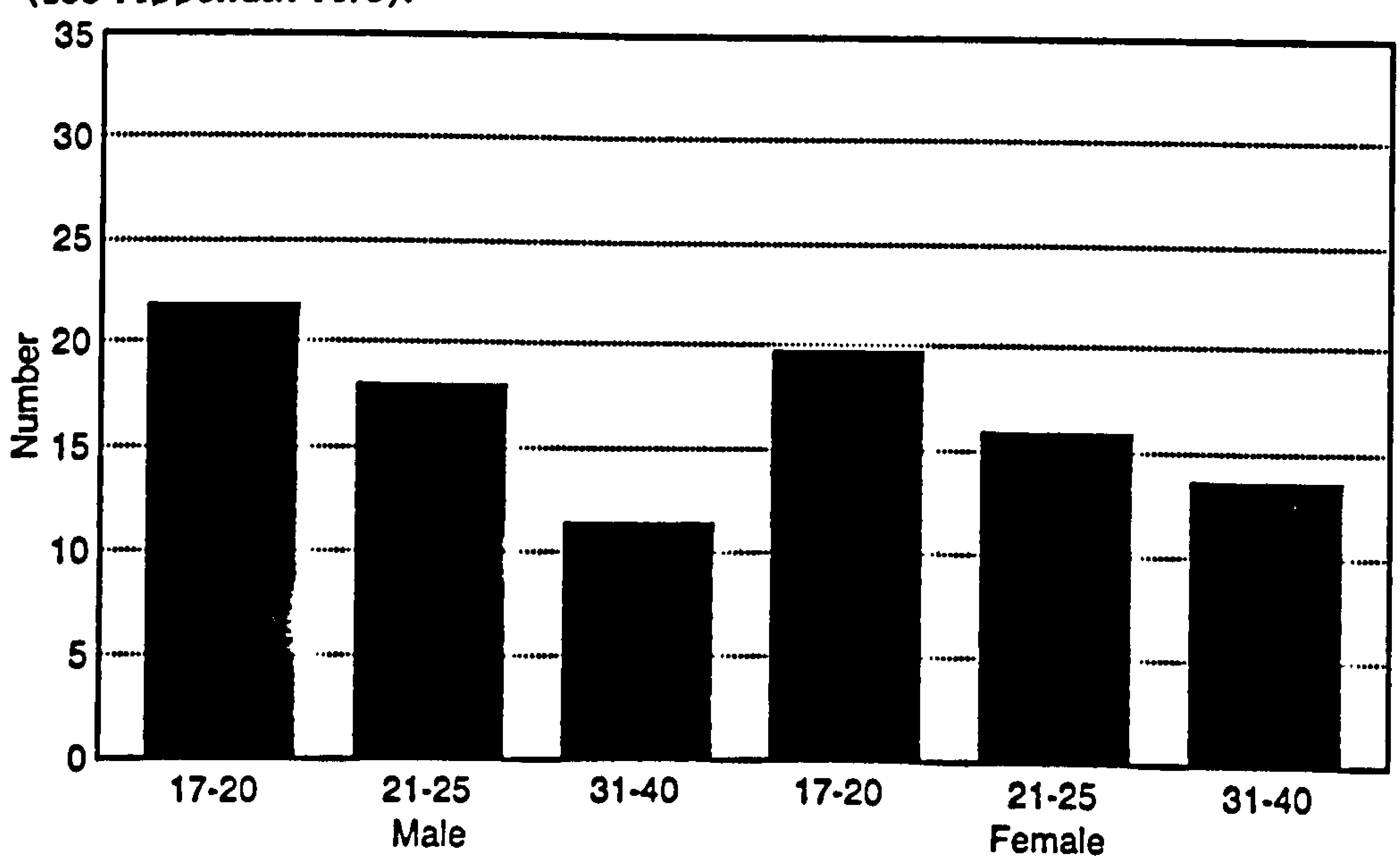


Figure 3.4: Speeding UDAs (average) per driver

For both sex groups, speeding UDAs decreased as age increased. This trend was more evident for the male groups. An ANOVA showed that only the age effect was significant at the 1% level of significance (see Appendix A.6).

In general, the observed UDA scores for each type of UDA were correlated significantly between each other, with the exception of 'slow speed' UDA of which there were very few (only correlated with 'joining traffic' manoeuvres ($r=0.18$, df.340, $p<0.01$) and 'erratic' manoeuvres ($r=0.13$, df.340, $p<0.01$). The total of all UDAs was highly correlated with each of the types of UDA (except slow speed) and provides a good overall UDA assessment score. The total UDA score was correlated highest with steering UDAs ($r=0.76$, df.340, $p<0.01$), mirror UDAs ($r=0.56$, df.340, $p<0.01$); positioning UDAs ($r=0.60$, df.340, $p<0.01$) and speeding UDAs ($r=0.65$, df.340, $p<0.01$), reflecting the predominance of these types of UDA in driving behaviour (see Appendix A.7 for full correlation matrix).

Examination of the UDA correlation with the annual accident frequency (NACY) and 'at fault' accident frequency (NFAY) showed that only erratic manoeuvre UDAs (NACY, $r=0.18$, df.340, $p<0.01$; NFAY, $r=0.16$, df.340, $p<0.01$) were correlated at a significant level. In particular, total UDAs fell far short of a significant correlation with <u>both</u> of the self-reported accident frequencies (NACY, $r=0.06$, df.340, $p>0.05$; NFAY, $r=0.07$, df.340, $p>0.05$). This was a disappointing result, given the later finding that known accident occurrence on the route in the previous three years did correlate significantly with total UDA and total dangerous UDA scores (see Section 3.2.4).

Very few of the factors representing the presence of each type of 'continuous UDA' which were observed to occur continually throughout the drive were correlated with each other. The exceptions being 'braking' UDAs and 'gear' UDAs ($r=0.13$, df.340, $p<0.05$); 'close following' and 'consideration to other road user' UDAs ($r=0.14$, df.340, $p<0.05$) and 'close following' UDAs and 'speeding' UDAs ($r=0.11$, df.340, $p=0.01$) The only significant correlation with either of the accident frequencies was between continually 'following too closely' and the 'at fault' accident frequency (r=0.13, df.340, $p<0.05$). Total UDA score correlated significantly with continuous UDAs of braking (r=0.14, df.340, $p<0.05$); steering (r=0.37, df.340, $p<0.01$); gears (r=0.18, df.340, $p<0.01$); mirrors (r=0.26, df.340, $p<0.01$) and speeding (r=0.22, df.340, $p<0.01$).

3.2.2 Dangerous UDAs by age and sex

An UDA was classified as dangerous or not dependent on the driver action in relation to the road environment at the time of the UDA. The number of dangerous driver UDAs for each age and sex category again showed that males aged 17-20 years made the most such UDAs with an average of over 11 dangerous UDAs per driver. For the male groups, average number of dangerous UDAs was high for both the 17-20 year and 21-25 year age groups, but then fell to the lowest average of all age and sex groups recorded by the 31-40 year old male group. With the female scores the two younger groups also made a higher average number of UDAs than the 31-40 year old group. Again, however, using an ANOVA, none of the differences between the driver categories reached significance (see Appendix A.6). Across all the age and sex categories speeding UDAs comprised around 90% of all the dangerous types of UDA (Table 3.2).

Table 3.2: Dangerous UDAs by type by age and sex.

UDA type	Male 17-20 Average	Male 21-25 Average	Male 31-40 Average	Female 17-20 Average	Female 21-25 Average	Female 31-40 Average
Speed	10.7	10.4	4.3	8.4	8.1	4.7
Others	0.9	0.6	0.3	1.1	0.8	0.5
Total	11.65	11.0	4.6	9.5	8.9	5.2

Dangerous UDAs were correlated between the types of dangerous UDA less well than UDAs, reflecting the less frequent occurrence of dangerous UDAs. High correlations were found between dangerous 'braking' UDAs and dangerous 'overtaking' UDAs ($r=0.40$, df.340, $p<0.01$); dangerous 'indicator' UDAs and dangerous 'positioning' UDAs ($r=0.47$, df.340, $p<0.01$) and dangerous 'following traffic' UDAs and dangerous UDAs with regard to 'consideration to other road users' ($r=0.53$, df.340, $p<0.01$). Correlations with the total dangerous UDA score were generally not significant except dangerous 'following traffic' UDAs ($r=0.45$, df.340, $p<0.01$), dangerous 'consideration' UDAs ($r=0.30$, df.340, $p<0.01$), dangerous 'overtaking' UDAs ($r=0.13$, df.340, $p<0.05$), dangerous 'erratic manoeuvres' ($r=0.14$, df.340, $p<0.05$) and dangerous 'speeding' UDAs ($r=0.99$, df.340, $p<0.01$). This extremely high correlation of dangerous speeding UDAs to total dangerous UDA score demonstrates the predominance of this type of dangerous UDA.

In a similar way to UDA scores, examination of the dangerous UDA correlation with the annual accident frequency (NACY) and 'at fault' accident frequency (NFAY) showed that only dangerous overtaking UDAs (NACY, $r=0.12$, df.340, $p<0.05$; NFAY, $r=0.15$, df.340, $p<0.01$) were correlated at a significant level. In particular, total dangerous UDAs fell far short of a significant correlation with both of the self-reported accident frequencies (NACY, $r=-0.04$, df.340, $p>0.05$; NFAY, $r=-0.03$, df.340, $p>0.05$). Again, this was a disappointing result, given the correlation between the known accident occurrence on the route in the previous three years with total UDA and total dangerous UDA scores (see Section 3.2.4).

The total dangerous UDA score showed a stronger sex difference than total UDA score, in that the two groups with the highest totals were the 17-20 and 21-25 year old male groups. With total UDA scores there was a stronger age difference in that the two groups with the highest totals were the 17-20 year old male and female groups. This finding might be explained by the higher proportion of driver <u>errors</u> likely to contribute to UDA scores (more minor UDAs) and the higher proportion of driver <u>violations</u> likely to contribute to dangerous UDA scores. This hypothesis would tend to confirm some findings of age and sex differences in driver error and violation performance (Reason *et al.*, 1989) (see Section 3.4.7).

3.2.3 UDAs by location

The route was divided into sections, which were either link sections or junction manoeuvre sections. There were five categories of link section where the driver had continuous priority and eight categories of manoeuvre sections where the driver may have had to give way or make a turning manoeuvre. The number of UDAs by each category of route are given (Table 3.3.i). The total number of UDAs for each link section was divided by the number of kilometres of that type and number of drivers in order to find out the average number of UDAs per kilometre per driver of link section. The total number of UDAs for each manoeuvre section was divided by the number of occasions that that manoeuvre occurred on the route (Table 3.3.ii).

Table 3.3: UDAs by route category.

(i) Link sections (max speed limit)	UDA total	Length of road kms	UDAs per driver per km
30 miles/h-shopping	2423	3.6	1.53
30miles/h- residential	7618	7.6	2.28
40miles/h	1648	4.6	0.82
50miles/h	3426	9.3	0.84
60miles/h	4638	11.7	0.90
(ii) Manoeuvre sections	UDA Total	Number of manoeuvre sections	UDAs per driver per manoeuvre section
Right turn (RT)	3543	9	0.90
Left turn (LT)	3715	9	0.94
Roundabout (RT)	2070	3	1.58
Roundabout (LT)	767	2	0.87
Traffic Lights (Ahead)	2130	11	0.44
Traffic Lights (LT)	1820	5	0.83
Traffic Lights (RT)	476	1	1.08
Pedestrian Crossing	762	6	0.29

Results showed that the locations with the highest average number of UDAs for link sections were both of the 30mile/h sections, in particular, within residential areas.

With respect to manoeuvres, the highest average number of UDAs were recorded on right turns both at roundabouts and traffic lights. Right and left turn UDAs were further examined by minor to major turnings and major to minor turnings. Major to minor turnings had more average UDAs per driver (average = 0.95) per turn than minor to major turnings (average = 0.90), but not to a significant level ($t=0.015$, df.16, $p>0.05$).

3.2.4 Dangerous UDAs by location

The same procedure (above) was used to determine the location of the highest average number of dangerous UDAs (Table 3.4).

The route sections with the highest number of dangerous UDAs per driver were both of the 30 miles/h sections, with the residential area again being the most dangerous. UDAs on these types of road were often marked dangerous, not just for the driver of the vehicle, but more importantly for pedestrians and children near the road. The 50 mile/h section also recorded one of the highest number of dangerous UDAs per driver due, possibly, to road works on a particular road which resulted in added congestion and restricted speed limits.
The manoeuvre sections with the highest average number of dangerous UDAs were right turns at roundabouts and pedestrian crossings, although these numbers were small.

Table 3.4: Dangerous driving UDAs by route category.

(i) Link sections (max speed limit)	UDA total	Length of road kms	UDAs per driver per km
30 miles/h-shopping	349	3.6	0.22
30miles/h- residential	1551	7.6	0.46
40miles/h	277	4.6	0.14
50miles/h	683	9.3	0.17
60miles/h	362	11.7	0.07
(ii) Manoeuvre sections	UDA Total	Number of manoeuvre sections	UDAs per driver per manoeuvre section
Right turn (RT)	47	9	0.01
Left turn (LT)	99	9	0.03
Roundabout (RT)	58	3	0.04
Roundabout (LT)	10	2	0.01
Traffic Lights (Ahead)	125	11	0.03
Traffic Lights (LT)	28	5	0.01
Traffic Lights (RT)	-	1	-
Pedestrian Crossing	96	6	0.04

The number of accidents occurring on each section of the route in the three and a half year period (1987 to mid-1990) was correlated with the total number of observed UDAs and dangerous UDAs in each of the 118 identified sections. The correlation between accidents and total UDAs was 0.21 which exceeds the 5% significance level ($r=0.18$, df.116, $p<0.05$). The correlation between accidents and total dangerous UDAs was 0.41, significant at the 1% level ($r=0.24$, df.116. $p<0.01$). Such significant correlations support the assertion that the observed assessments of driving performance do, indeed, reflect the level of safety in varying conditions and provide an indicator of accident potential.

3.2.5 Overall assessments of driving by observers and drivers

Self-assessed and observed scores for driving performance on the route survey were recorded across six measures (ability, safety, anticipation, concentration, observation and car control) (see Appendix A.2.2 for definition). All assessments were based on a 7 point continuous scaling procedure (1-7). The lowest possible rating was 1= 'very bad or unsafe' with the highest being 7= 'very good or safe' with a mid-point mark of 4.

3.2.5.1 Assessments of ability

The self-assessed and observed scores for ability were compared across age and sex (Figure 3.5).

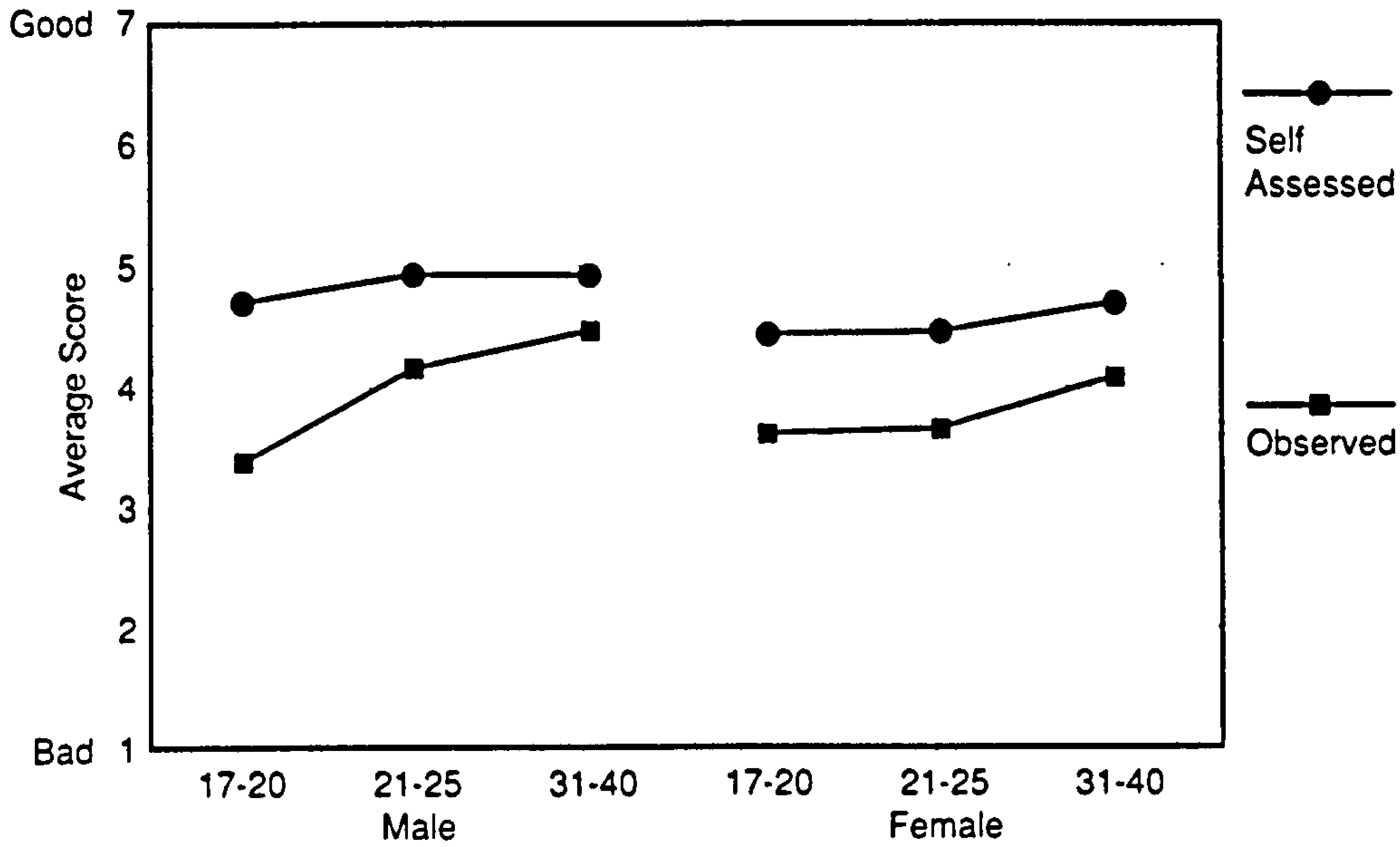


Figure 3.5: Assessments of ability (self-assessed and observed)

Observed ability increased noticeably with age for the male groups, whereas it increased only slightly with age for the female groups. There was a significant difference between the 17-20 year old male observed scores and both of the other male age groups (Mann-Whitney, $Z=3.56$ in comparison to 21-25 year olds and $Z= 4.48$ in comparison to 31-40 year olds, $p<0.01$), but no difference between the 21-25 and 31-40 year old male group scores (Mann-Whitney, $z=1.38$, $p>0.05$) (see Appendix A.6). These results confirm that the youngest male group of drivers were significantly less able drivers than the other male groups.

There were no significant results with the female ability scores across groups (A.6) suggesting that all the female driver groups were of a similar standard of driving ability. Comparisons of driving ability within age group but across sex group showed only one significant difference; that between the 31-40 year old male and female driver groups (Mann-Whitney, $Z=-2.01$, $p<0.05$). The negative value indicated that the male 31-40 year old group were assessed as having greater driving ability than the corresponding female age group and were, in fact, rated the best of all the driver groups (see Appendix A.6). Age would appear to be an important factor since young males (17-20 years) were rated the 'worst' drivers of all the groups, whereas older drivers (31-40 years) were rated the best of all the groups in terms of driving ability.

All of the age and sex groups assessed themselves to be better at driving ability than they were assessed by the observers. All of the these differences for all of the age and sex groups were significant at the 1% level (Wilcoxon, $Z=1.97$ to $Z=5.54$, $p<0.01$) (see Appendix A.6). The largest significant difference was with the youngest male age group (17-20 years) suggesting they were the least accurate assessors of their own driving ability. Thus, the youngest male group (17-20 years) believed themselves to be as able on the roads as the other age and sex groups and yet their observed performance indicated otherwise. Only one of the comparisons of self-assessed scores across the six driver groups was significant, with the 21-25 year old male group rating themselves significantly 'more able' drivers than the corresponding female age group of drivers (Mann-Whitney, $Z=-3.18$, $p<0.01$ (A.6). However, the observed rating did not confirm this assessment, although the result (Mann-Whitney, $Z=-1.92$, $p>0.05$) was close to significance (see Appendix A.6).

These 'over-estimation' results might be predicted in the light of 'superior conformity of the self' behaviour (Codol, 1975) (see Section 5.1.1).

3.2.5.2 Assessments of safety

The observed and self-assessed scores for safety across age and sex were examined (Figure 3.6).

The safest group of drivers was observed to be the 31-40 year old male group and the least safe the 17-20 year old male group. The youngest male driver group were observed as significantly less safe drivers than either the 21-25 year old male drivers (Mann-Whitney, $Z=3.79$, $p<0.01$) or the 31-40 year old male drivers (Mann-Whitney, $Z= 5.25$, $p<0.01$). No significant differences were evident between the 21-25 or 31-40 year old driver groups (Mann-Whitney, $Z=1.85$, $p>0.05$. None of the female group 'safety' scores was significantly different (see Appendix A.6).

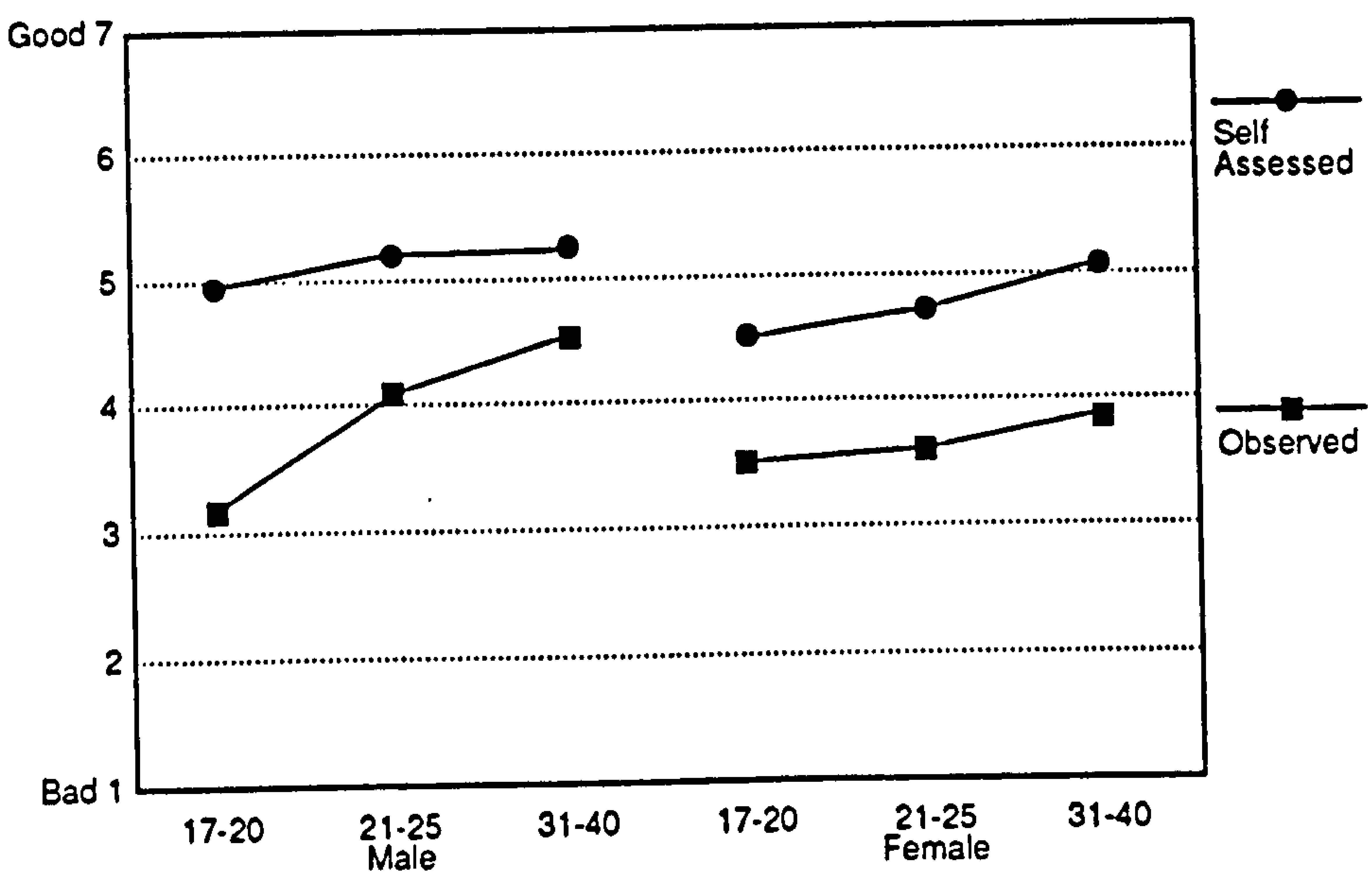


Figure 3.6: Assessments of safety (self-assessed and observed)

Comparison of observed scores across sex groups showed that the 17-20 year old female group of drivers were observed to be safer drivers than the 17-20 year old male group, close to the 5% level of significance (Mann-Whitney, $Z=1.78$,

$p>0.05$). However, with the oldest age group (31-40 years) comparison, the male drivers were rated as 'safer' drivers than the female group (indicated by the negative Mann-Whitney value, $Z=-2.37$, $p<0.05$) (see Appendix A.6). It would appear that young male drivers (17-20 years) were the least 'safe' drivers and older male drivers (31-40 years) the most 'safe', with the female driver groups observed to be somewhere in between these two extremes.

As with the ability ratings, all of the driver groups rated themselves significantly 'safer' drivers than they were observed. All of the results were at the 1% level of significance (Wilcoxon, $Z=3.36$ to $Z=7.09$, $p<0.01$) with the youngest male group once again being the being the least accurate in their assessment (see Appendix A.6).

The youngest male group (17-20 years) rated themselves slightly less safe than the other male driver groups, in contrast to their behaviour in terms of known accident rates and UDA scores on the drive. A similar pattern was also evident with the female driver groups. Both the younger male group (17-20 years) and the 21-25 year old male age group rated their driving as significantly 'safer' than their corresponding female age groups (17-20 years male and female, Mann-Whitney, $Z=-2.41$, $p<0.05$; 21-25 years male and female, Mann-Whitney, $Z=-2.56$, $p<0.05$) (Appendix A.6).

3.2.5.3 Other measures

The observed and self-assessed scores for anticipation, concentration, observation and car control across age and sex were also examined. A similar and consistent pattern to the ability and safety measures was shown across all these measures in that all groups of drivers rated themselves better at the particular driving measure than they were observed, with the male 17-20 year old group being the least accurate in their self-assessments in comparison to their observed scores.

With regard to car control, as a whole, the female drivers tended to score lower (perform worse) than the male drivers. This suggests that driver skill (car control and handling) is not necessarily a particularly influential factor on accident involvement since female drivers tend to have a relatively good accident record.

In general, the male, 17-20 year old group was the least accurate in their assessment of their driving behaviour across all the measures. Consistently rated the worst group on all the measures, the young male group (17-20 years) nevertheless rated themselves roughly on a par with the other age and sex groups.

The overall observers' driving assessment scores were highly correlated with each of the six types of UDA (in the range $r=0.71$, df.337, $p<0.01$ for 'concentration' measure to $r=0.87$, df.337, $p<0.01$ for 'safety' measure) so use of a total or average score would be well justified. A similar situation prevailed with the self-assessed scores, although the correlation range was lower (from $r=0.43$, df.337, $p<0.01$ for 'concentration' to 0.70, df.337, $p<0.01$ for 'safety' measure), but still highly significant (see Appendix A.7). The finding that safety was most highly correlated with overall driving assessment for both observers and the drivers might be expected as this is perhaps the most important measure of overall driving performance. However, as shown in Section 5.2, safety is not given the same priority as a measure of driving ability by the 'unsafe' young drivers.

Of real interest was the finding that the observers' scores were all significantly and negatively correlated with both the accident frequency variables (NACY = 'number of accidents'; NFAY = 'number of 'own fault' accidents' in range $r=-0.13$, df.337, $p<0.05$ for 'anticipation' measure to $r=-0.21$, df.337, $p<0.01$ for 'safety' measure) indicating lower accident frequencies to be associated with higher (and better) assessment scores. However, with the drivers' self assessment scores only one measure (for 'anticipation', $r=-0.13$, df.337, $p<0.05$ and only with NACY frequency variable) just reached a significant level, the correlation again being in the same direction as before (negative). This demonstrates that observers' driver assessments accurately reflected reported accidents of the drivers whereas driver self-assessments (with the one exception of the anticipation measure to NACY) did not. This is revealing since the drivers actually knew their accident history whereas the observers did not, and yet despite this, drivers' assessments of their own driving would not seem as accurate as the observers' assessments.

3.2.6 Which drivers drove to Department of Transport test standard?

At the end of each drive, the observers made an overall subjective assessment of whether the driver drove up to Department of Transport (DTp) driving test standard on the route taking into account any driving UDAs made. It is recognised that the drivers were not aware that they were being assessed and that the driving task they were asked to perform was considerably different to the driving test. It is also acknowledged that the drivers might have been capable of maintaining a DTp test standard if they had been asked to do so. This was not the case as drivers were asked to drive in their 'normal' way. Nevertheless, the percentage of drivers in each age and sex group that were adjudged to have actually driven to DTp test standard during the route survey is shown in Table 3.5.

Table 3.5: Drivers (%) who drove to Department of Transport test standard.

	Male			Female		
	17-20	21-25	31-40	17-20	21-25	31-40
DTp standard or above (%)	5	11	34	10	6	17
Below DTp standard (%)	95	89	66	90	94	83

(percentage)

As age increased, the percentage of drivers who would have passed a driving test increased. This was an interesting result given the fact that these older groups of drivers had passed their test less recently than the other groups.

3.2.7 Are all drivers within an age and sex group the same?

One of the problems with using average scores is that certain high or low scores can have a disproportionate effect on the average. Therefore, the distributions of the driver UDAs and driver ratings within age/sex groups were examined.

3.2.7.1 Distributions of UDA scores

The distributions of UDA scores within age and sex group were examined. The percentages of drivers in each age and sex group by number of UDAs are shown (Table 3.6).

19% of the 17-20 year old male group made 140 or more UDAs per drive along with 20% of the 21-25 year old male group. In addition, only 1% of the 17-20 year old male group scored less than 20 UDAs per drive compared to 24% in the 31-40 year old male group. Female scores did not vary so markedly across age, although a higher percentage of the 17-20 year old age group scored 140 or more UDAs in comparison to the other age groups.

Table 3.6: Frequency distribution (%) of UDA scores

Number of UDAs	Male			Female		
	17-20	21-25	31-40	17-20	21-25	31-40
<20	1	18	24	7	2	6
20-59	32	29	41	38	42	28
60-99	25	20	18	23	28	32
100-139	23	13	9	15	16	27
140-179	14	16	8	10	8	6
180+	5	4	0	7	4	1
Total	100	100	100	100	100	100

(rounded to nearest percentage)

3.2.7.2 Distributions of dangerous UDAs

The distributions of dangerous UDA scores across age and sex were also examined. The percentage of drivers in each age and sex group by number of dangerous UDAs is shown (Table 3.7). 9% of the young male (17-20 years) group made over 40 dangerous UDAs on the route compared with only 1% of drivers in both the male and female 31-40 year old groups.

A similar, but less marked, trend to the UDA frequency was found with dangerous UDA frequency in that fewer males in the 17-20 year age group scored less than 10 dangerous UDAs and a higher percentage scored over 40 dangerous UDAs than the other age and sex groups.

Table 3.7: Frequency distribution (%) of dangerous UDA scores

Number of UDAs	Male			Female		
	17-20	21-25	31-40	17-20	21-25	31-40
<10	66	73	88	75	69	82
10-19	18	9	7	10	19	13
20-29	6	7	3	3	8	4
30-39	1	4	1	5	-	-
40-49	6	1	-	3	2	1
50-59	-	4	-	2	-	-
60-69	3	2	1	2	2	-
Total	100	100	100	100	100	100

(rounded to nearest percentage)

3.2.7.3 Distributions of driver ratings

The distributions of observed driver ratings across age and sex were examined (Table 3.8).

As many as 19% of the 17-20 male drivers scored the lowest possible observed safety rating. 13% of the 17-20 year old female groups were located at this lowest end of the frequency.

Table 3.8: Distributions (%) of driver ratings (observed) for safety

Safety rating	Male			Female		
	17-20	21-25	31-40	17-20	21-25	31-40
1 (Bad)	19	5	3	13	2	5
2	15	13	8	16	17	11
3	30	12	19	16	19	29
4	15	27	16	18	39	15
5	14	29	25	27	17	23
6	7	13	19	7	6	16
7(Good)	-	1	10	3	-	1
Total	100	100	100	100	100	100

(rounded to nearest percentage)

3.2.8 Discussion

In some respects, it would appear that the route surveys were a reasonable measure of driving performance. Firstly, the younger male groups were found to commit the largest number of UDAs per group, a finding which might be expected given this groups' over- representation in the accident statistics. Secondly, and more importantly, the validity of the route surveys might be evidenced by the correlation between location of UDA occurrence and known accident location on the route over the previous three and a half years. To some extent, such findings confirm the evaluation of route surveys as a valid research tool (Harvey *et al.*, 1975; Quimby, 1988).

However, the lack of a significant correlation between UDA scores and dangerous UDA scores and individual driver self-reported accident histories (with the exceptions of 'erratic manoeuvre' UDAs and dangerous 'overtaking' UDA) suggests that the performance evaluation element of the route survey was associated at an overall observed, but not an individual driver UDA level. Such findings are extremely similar to those reported by Reisser (1985) who found accident data reported by drivers (N=201) not to be correlated with traffic conflicts drivers got involved in on an hour's driving test route, but that more traffic conflicts were recorded on the route where more accidents had occurred in the previous 5 years.

Observers' overall rating scores of driver performance were good predictors of self-reported driver accident histories and correlated well with total UDA scores, but not total dangerous UDA scores. This suggests that the expert observers were able to identify those drivers who were high accident involved drivers on an overall measure of driver performance.

A possible reason for the fact that an overall assessment did correlate with driver accident histories whereas driver UDA score (dangerous or not) did not is that it is not <u>necessarily</u> the number of UDAs that a driver makes whilst driving which contributes to accidents (although it does not help), but the severity. Thus, a driver may perform relatively few UDAs on a route but those that are made may be particularly dangerous. In this case, a person may have a low total UDA score, but nevertheless be observed as an 'unsafe' driver on overall performance at the end of the drive. Such an explanation may account for why only 'erratic manoeuvre' and dangerous 'overtaking' UDA scores correlated with either of the accident histories and total UDA and dangerous UDA scores did not.

As mentioned previously (Section 2.2.2.1), Harvey *et al.* (1975) did not report data (although it was collected) to show whether there was a relationship between individual UDA scores and accident occurrence. In the current study, there was, (apart from the two measures reported above), no significant relationship between individual UDA scores and accident occurrence. It would appear that the route survey component of the study showed that UDAs were indicative of accident conflicts at particular sites (Harvey *et al.*, 1975), but not for individual driver accident history, a finding which was found by Quimby and Watts (1981), but that overall observed ratings were indicative of individual driver accident history.

One of the methodological problems with the use of route surveys which is particularly obvious, given later findings (Sections 3.4.3 and 7.2), concerns the effects of passengers. Drivers performing the route survey were accompanied by 'strangers' as passengers (the route director and observer). Although it was stressed that the driver should try to drive as 'normally' as possible and that traffic and road environment conditions were the object of the study, it has to be recognised that some drivers probably drove slightly differently. In some of the smaller cars, this may have been simply due to the additional weight load of passengers, ignoring the possible social effects of having strangers present. It is most likely that drivers modified their driving behaviour to be slightly 'safer' than normal given the unusual circumstances of the drive. Despite this problem, the route survey technique enabled an extremely detailed analysis of 'everyday' driving behaviour to be recorded, the complexity of which would not have been possible through the use of other methods.

The presentation of data in averaged group format can disguise the variations between members of particular categories and may lead to a false impression of homogeneity. In other words, not all, but a substantial minority of young male drivers were rated 'unsafe' and not all, but a substantial minority of older drivers were rated 'safe'. Nevertheless, it must be noted that on a number of driving measures a higher percentage of younger drivers, males in particular, could be said to be 'unsafe' compared to other age and sex groups.

Over self-rating of driver ability was confirmed but on a number of different measures and this was compared to a driver of similar age and experience thus nullifying one criticism of some previous studies that comparisons were made between different groups of drivers (Svenson, 1981). Furthermore, results showed that the younger male group of drivers tended to be the least accurate in their ratings. This was because they rated their driving as good as other driver groups when their performance was assessed to be considerably poorer. These younger drivers did not actually rate themselves better than other groups of drivers, but did not realise that they were, in fact, performing worse. A number of reasons can be presented for this including non-recognition of feedback in the driving domain (ie not recognising a 'near-miss' as unsafe driving), lack of memory availability for infrequent events (ie 'near misses') or placing the blame for UDA occurrence on the environment or other drivers, rather than one's own actions (Firth and Geoffery, 1980). This topic is discussed in more detail in Section 5.5.

The route survey component of the study was unique in the depth of analysis that was conducted on the sample size. Relying merely on driver (self-reported) accident history may lead to an inaccurate assessment of driver behaviour. The use of a route survey allied to driver self-reported history enabled a more accurate assessment of driver behaviour.

It would have been extremely useful if some method could have been devised to distinguish between driver errors and violations within each UDA type. How this could be done is uncertain due to the interpretive nature of the difference between error and violation, ie should a UDA where a driver goes through a red light be marked an error or a violation when it is uncertain whether the driver was unaware of the red light or chose to continue regardless? It might be argued that speeding behaviour over the limit by 10% could be classified as primarily a driver error and speeding above this level a violation. If this interpretation is accepted, then an on-road study examining such differences could reveal observed, rather than reported, errors and violations (Baxter *et al.*, 1989).

The route surveys demonstrated the prevalence of different types of UDA which occur in driver behaviour. Steering, mirror, positioning and speeding UDAs were the most common type of UDA. Speeding was shown to be a particular problem with respect to dangerous UDAs. Speeding has previously been shown to be an UDA frequently performed by young males in numerous studies (Williams, Lund and Preusser, 1984; Harrington and McBride, 1970; Karpf and Williams, 1983; Schuman and Pelz, 1972). Changing lanes without indicating and driving at above 40 mile/h in 30 mile/h limits (speeding) were also shown to be the most frequent aberrant driving behaviours in the later car following study by Reason *et al.*, (1991); steering and mirror UDAs were not able to be recorded in that study due to the distance between the drivers and observers. The route surveys have also shown the locations where UDAs occur most frequently. These were identified as residential 30 miles/h areas and right turns on roundabouts and traffic lights. Such results confirm previous analyses of accident data (Broughton, 1988) and provide a further validation of the route survey procedure.

A number of practical difficulties with the route survey procedure emerged during the study. The first concerned the subsidiary task given to subjects in order to make them less aware of the performance assessment aspect of the drive. Although the task used appeared to work well for the majority of drivers, it was noticeable that a small number of drivers (either through their comments or driver actions) were attempting to put on a driving performance as they might under driving test conditions. If this occurred, the 'route director' re-emiles/hasised the subsidiary task and tried to get the driver to relax by emiles/hasising the 'non-test' aspect of the drive. The choice of a 40 km route was crucial and ensured that it was difficult for drivers to maintain an artificial concentration and performance level for the entire duration of the drive.

A second difficulty was that major road works on some part of the A33 (T) road changed during the period of the route surveys (see Figure 2.1). This was unavoidable, but meant that a high number of UDAs were recorded on this 50 mile/h section reflecting driver difficulties with road works. The UDA scores recorded here were caused by driver/road work interaction difficulties and were not necessarily the fault of the drivers, but also occurred as a result of incorrect road sign layout at the road works. Due to this difficulty, a larger number of

UDAs were recorded on the 50mile/h sections than might have been predicted under more 'normal' traffic conditions. Nevertheless, a similar proportion of drivers in each of the age and sex categories drove the route survey under the different conditions.

A third difficulty concerned those drivers (n=16) who turned up for the route survey particularly late (and another route survey was due in the next hour) or who were such 'dangerous' drivers (n=9) that the 'route director' or 'observer' became worried for their own safety. In either of these circumstances, the route survey was shortened or curtailed completely. In these cases, particularly with respect to the 'dangerous' drivers, the total number of UDAs recorded were artificially low because they had not completed the entire route. A revised UDA total was devised for these drivers (n=25) based on the number of UDAs made on the parts of the route they had completed.

3.3 Driver patterns

Data collected from the driving diaries comprised the largest amount of data. 94% of the diaries given to subjects who drove on the route survey were completed and returned. The reported number of journeys that were not recorded by the subjects in the specified one or two week period was extremely low.

3.3.1 Total number of journeys and distances

There were 11,665 journeys recorded in the diaries covering a total of 91,726 miles incorporating over 3,250 hours of driving time at an average speed of 28.2 miles/h.

The weekly average number of journeys and mileage is shown in Table 3.9. The average number of journeys per week and weekly mileage increased with age for the male groups in contrast with the female groups where the 21-25 year old drivers made the most number of journeys and had the highest weekly mileage.

Overall females tended to make more journeys per week than males. Females' journeys were generally of a shorter distance than male journeys. The 31-40 year old female group made shorter journeys than all the other groups.

Table 3.9: Weekly number of journeys and distance driven.

	Male			Female		
	17-20	21-25	31-40	17-20	21-25	31-40
Number of journeys (ave)	20	24	27	23	29	28
Weekly mileage (ave)	173	232	257	145	190	153

(to nearest whole number)

3.3.2. Purpose of journeys

The purposes for which subjects used their car were investigated. (Figure 3.7). There were 17 categories of journey type which were combined into 4 types of journey (to/from work/school, shopping, leisure and other).

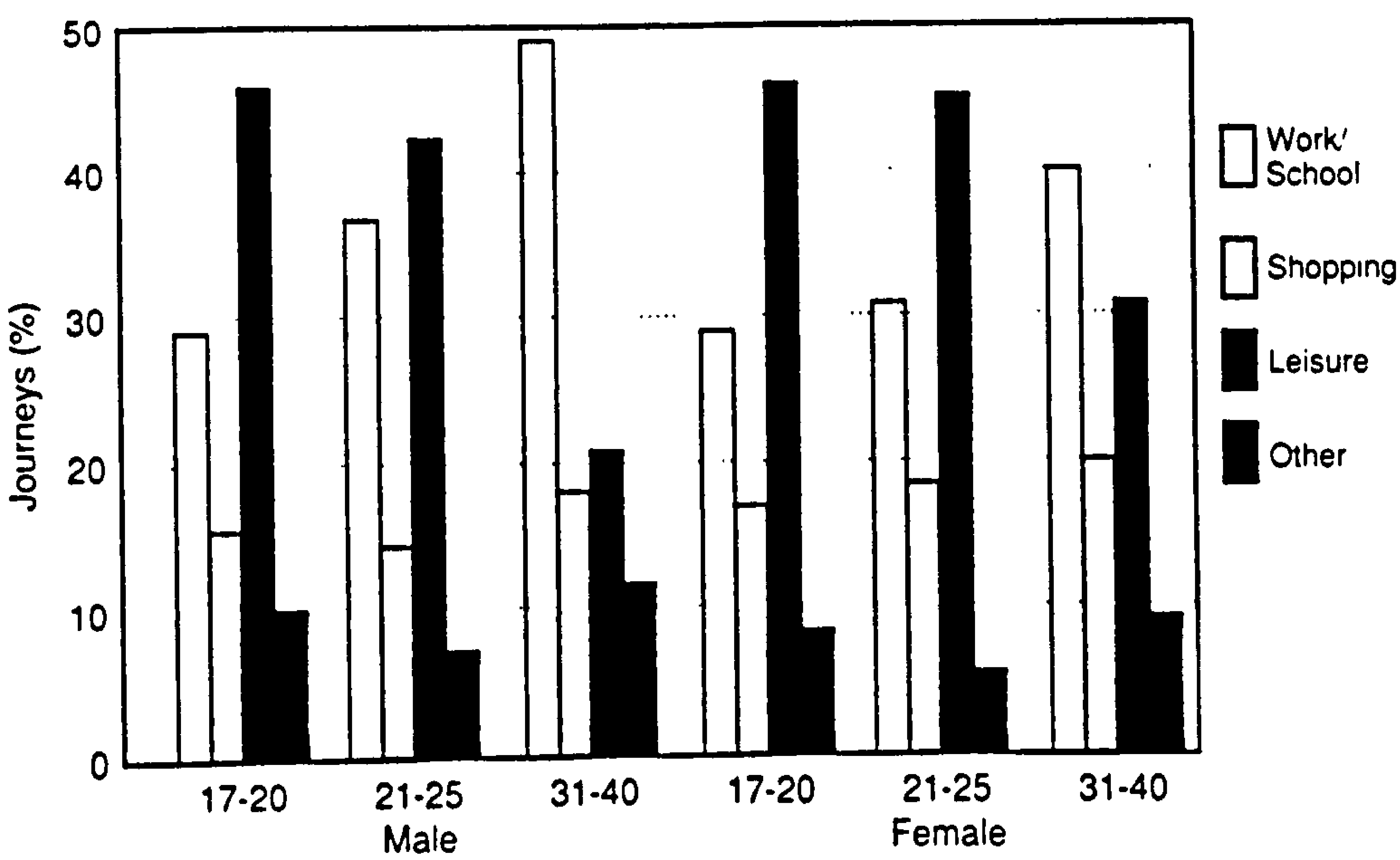


Figure 3.7: Purpose of journeys

The major findings were that as age increased drivers spent a greater percentage of their driving time using the car for work/school purposes and less of their time for leisure purposes.

Information concerning the use of the car by journey purpose (categorised as work, shopping, leisure or other) was available from the questionnaire and also from the driving diary. The questionnaire data provided estimates of the percentage of driving time by purpose, while the diary data provided estimates by purpose of the percentage of journeys, percentage of mileage and percentage of time.

Within the diary data the percentage of mileage and percentage of time estimates were very highly correlated with each other for the corresponding journey purpose (within the range $r=0.94$ for 'shopping' journeys to $r=0.96$, df.333, $p<0.01$ for 'leisure' journeys). Both of these measures (mileage and time) from the diary data were also highly correlated (within the range $r=0.75$ for 'leisure' journeys to $r=0.83$, df.333, $p<0.01$ for 'work/school' journeys) with the percentage of journeys by purpose from the diaries (see Appendix A.7 for correlation matrix).

Correlations of the percentage of times from the diary and from the questionnaire for all the types of journeys were not as high (within the range $r=0.38$ to $r=0.55$, df.333, $p<0.01$), but still very significant statistically. Such findings provide support for the use of either driving diaries or questionnaire data collection as a valid methodological tool. Within diary data either percentage of mileage or time estimates for journey types would be equally valid given their high correlation. Alternatively, using percentage of journey times from questionnaire data could yield comparable data.

3.3.3 Passenger details

The percentage of their driving time that subjects spent with and without passengers was examined (Figure 3.8).

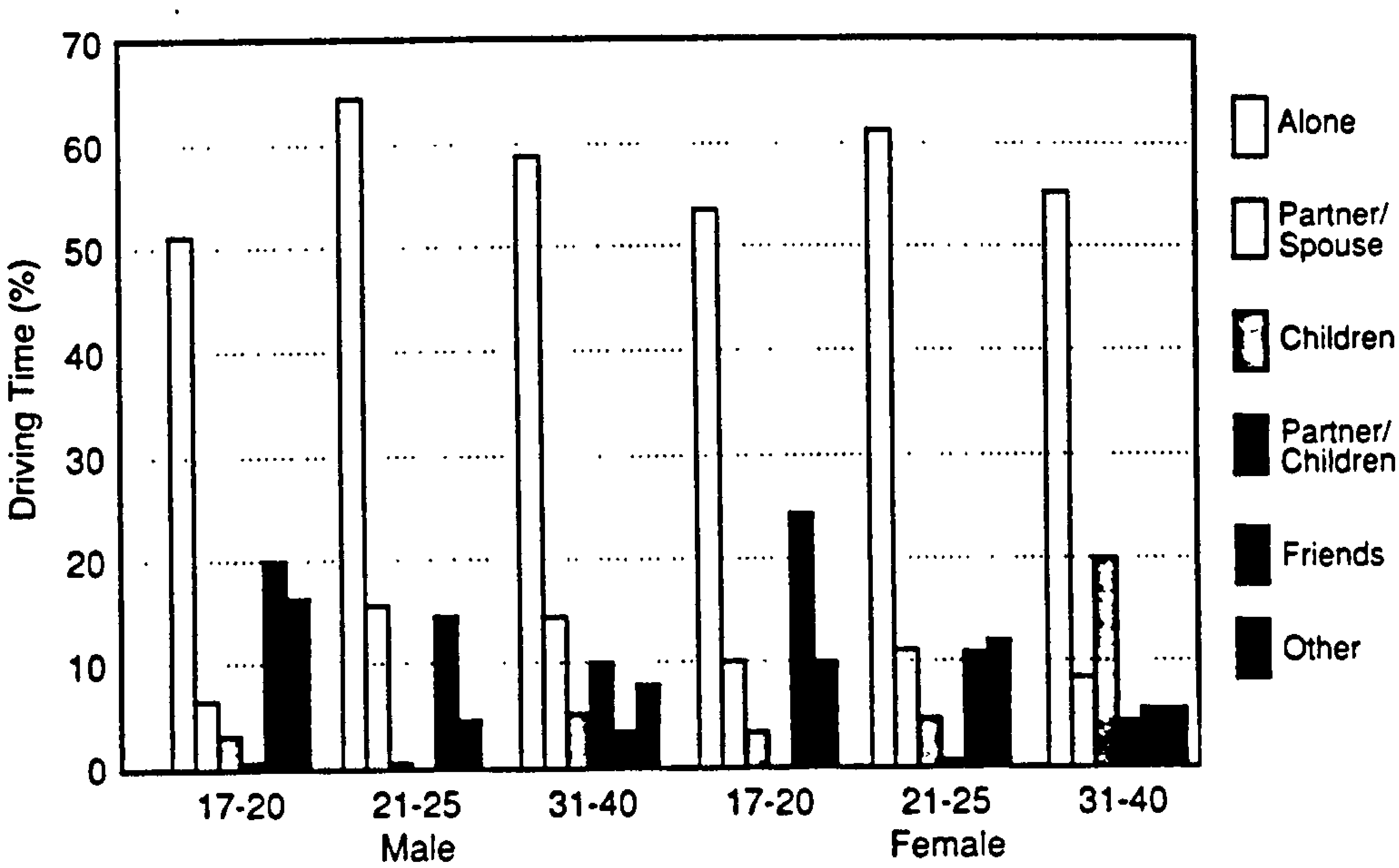


Figure 3.8: Passenger occupancy

Results showed that the younger age group (17-20 years) of both sexes spent a much greater percentage of their driving time accompanied by friends than the older age groups. For males, the 31-40 year old group drove with friends for only 3% of the time compared with 20% and 14% for the 17-20 and 21-25 age groups; for females the corresponding percentages were 6%, 24% and 11%. The other most obvious difference was that older females spent a greater percentage of their driving time accompanied by children compared to all the other age and sex groups.

In the same way as for journey purpose, data on the percentages of driving time spent with different types of passengers (alone, partner only, children only, partner and children, friends and others) were available from both the questionnaires and the driving diaries and similar patterns of correlations were found between the sets of percentage estimates.

For 'at fault' accident frequency, the only correlation to reach significance was that with the percentage of time spent with friends ($r=0.16$, df.339, $p<0.01$)

which had a positive value indicating higher levels of accident frequency to be associated with higher percentages of driving time accompanied by friends (although not significant, correlations with other passenger types were negative correlations). This variable was based on the questionnaire data and while the corresponding variables from the diary data also had positive correlations with 'at fault' accident frequency, they were not statistically significant ($r=0.10$, df.333, $p>0.05$).

The total UDA score also provided significant correlations with the percentage of journeys, mileage and time spent driving with friends, based on the diary data (all three values being $r=0.12$, df.333, $p<0.05$). The total dangerous UDA score showed no significant correlations with these passenger type variables, the nearest to reaching significance however, again being proportion of driving time spent with friends ($r=0.06$, df.333, $p>0.05$).

The percentages of journeys, mileage and driving time by number of passengers were obtained from the driving diaries. No significant correlations were found for 'at fault' accident frequency, total UDAs or total dangerous UDAs. With accident frequency, the only correlation to reach marginal significance was for the percentage of journeys with two or more passengers ($r=-0.12$, df.333, $p<0.05$). This negative correlation suggests that accident frequency falls as passenger numbers increase. It must be noted that this finding does not take account of the type of passenger.

3.3.4 Radio cassette use

The amount that drivers use their radio cassette whilst driving is shown (Table 3.10). Amount and type of use varied across age and sex. The male and female 31-40 year groups and the 21-25 year old female group drove for over 40% of their time not listening to the radio or cassette. The amount of time that music was played in the car decreased as age increased across both sexes.

Such results were of some significance in the light of the reported influence that the radio cassette can have on driving behaviour (Chapter 7).

Table 3.10: Percentage of journeys with radio cassette in use

Radio cassette use (%)	Male 17-20	Male 21-25	Male 31-40	Female 17-20	Female 21-25	Female 31-40
Nothing	33	28	48	23	40	42
Music	57	60	34	64	50	37
Speech	1	5	11	2	2	6
Mixture (music/speech)	9	8	8	10	8	16
Total (%)	100	100	100	100	100	100

(to nearest percentage)

The percentage of journeys, miles or time while driving with the radio cassette on showed no correlation at all with accident frequency, but were all significantly and positively correlated with total UDAs (percentage of journeys $r=0.15$, $p<0.01$; percentage of mileage $r=0.12$, $p<0.05$ and percentage of time $r=0.13$, $p<0.05$, df.333) and total dangerous UDAs (percentage of journeys $r=0.18$, $p<0.01$; percentage of mileage $r=0.15$, $p<0.01$ and percentage of time $r=0.17$, $p<0.01$, df.333). These results suggest that those drivers who made the most UDAs and total dangerous UDAs on the route were also the drivers who reported the most radio cassette use (see Section 7.3).

3.3.5 Time of day of journeys

Broughton (1988) showed the time of day has an effect on accident occurrence. It is likely that this finding is affected by different exposure levels across the age and sex groups. In order to determine this the time of day of the journeys recorded in the driver diaries across each of the driver groups were examined.

3.3.5.1 Time of day of all journeys

The percentage of journeys by time of day was examined (Table 3.11). Approximately one tenth of all journeys for the 17-20 and 21-25 year old groups took place between 10pm and 4am compared to less than half that amount for all journeys by both of the 31-40 year old groups.

Table 3.11: Journeys (%) by time of day

Journey time of day	Male 17-20	Male 21-25	Male 31-40	Female 17-20	Female 21-25	Female 31-40
4am - 8am	6	8	7	5	5	4
8am - 12pm	21	20	26	21	23	31
12pm - 4pm	22	20	25	22	25	29
4pm - 6pm	17	17	17	17	17	15
6pm - 8pm	14	16	14	15	15	12
8pm - 10pm	9	9	7	10	7	6
10pm - 12am	7	7	3	7	6	2
12am - 4am	4	3	1	3	2	1
Total (%)	100	100	100	100	100	100

(to nearest percentage)

3.3.5.2 Night time passenger occupancy

It is evident from results (above) that the 17-25 year old age groups drive for a higher percentage of their overall number of journeys between the hours of 10pm and 4am when compared to the 31-40 year old groups. These so-called 'night time' journeys were examined to find out what type of passengers were present on these journeys (Table 3.12).

Of those drivers on the road between the hours of 10pm and 4am there are proportionately more younger drivers (17-25 years old) on the road than older drivers (31-40 years old). These younger drivers are also accompanied by friends for higher percentages of their driving journeys than older groups.

Table 3.12: Night time journeys (%) by passenger presence

Driver age	17-20				21-25				31 40				Total (%)
Passenger	A	P	F	O	A	P	F	O	A	P	F	O	
10pm-12pm													
Male	12	3	5	2	10	4	5	2	6	3	1	2	100
Female	10	2	1	5	7	1	3	2	6	2	2	1	
12pm-4am													
Male	19	2	4	5	11	2	5	1	5	2	1	2	100
Female	10	0	5	3	7	1	1	4	7	1	2	2	

(rounded to nearest percentage)

Key:
A= Alone P= Partner
F= Friends O= Other passengers/combinations

3.3.6 Subjective ratings of driving

Self-assessed ratings of a number of variables on 'risk', 'enjoyment', 'haste', 'tenseness', 'tiredness' and the 'ability to concentrate' for each diary journey were examined. The rating scale went from 1= not at all to 7= extremely.

3.3.6.1 Overall ratings by age and sex

The overall ratings for each journey were examined. There were no large differences within sex and age group across the different ratings. This was not surprising as these ratings were not sensitive enough to take account of type of journey, passenger type, passenger number, time of journey and so forth. Assessment ratings within age and sex group are likely to be less marked than between age and sex group. However, due to possible different base level interpretations of the ratings between driver groups (ie what is assessed as very risky behaviour by a 31-40 year old driver might not be assessed at all risky by a

17-20 year old driver), it would be incorrect to compare ratings across age and sex groups. The two most different types of journey were compared (work journeys versus leisure journeys) to see if there were any differences within the groups between these two extremes. Effects between less contrasting journey types were of little significance.

3.3.6.2 Ratings for work and leisure journeys only

The average ratings for work journeys only and leisure journeys only were examined (Tables 3.13 and 3.14). The ratings appeared to show that work journeys were rated as more hurried, more tense, more tiring and less enjoyable than leisure journeys.

Table 3.13: Average ratings for work journeys only

Ratings (work)	Male 17-20	Male 21-25	Male 31-40	Female 17-20	Female 21-25	Female 31-40
Risky	2.5	2.1	2.2	1.8	2.1	1.8
Enjoyable	3.7	3.6	3.9	3.5	3.5	3.3
Hurried	3.6	3.1	2.7	3.1	3.2	3.7
Tense	2.4	2.4	2.2	2.4	2.6	2.5
Tired	2.6	2.5	2.2	2.3	2.6	2.6
Concentration	5.2	5.2	5.5	4.8	5.0	5.7

Leisure journeys were rated as more enjoyable than work journeys. Concentration level and risk ratings across the two journey types did not show any clear patterns. It would seem that there is little evidence in this work to suggest that type of journey affects driver state to any great extent and thus examination of other possible influencing factors may be more worthwhile.

Table 3.14: Average rating for leisure journeys only

Ratings (leisure)	Male 17-20	Male 21-25	Male 31-40	Female 17-20	Female 21-25	Female 31-40
Risky	2.2	2.2	2.1	1.9	1.9	1.9
Enjoyable	4.6	4.3	4.6	4.5	4.4	4.5
Hurried	2.7	2.8	2.1	2.1	2.3	2.3
Tense	2.0	2.3	1.9	1.9	2.1	2.0
Tired	2.3	2.4	2.1	1.9	2.4	2.3
Concentration	5.1	5.3	5.5	5.0	5.3	5.2

3.3.6.3 Effects of passenger numbers and types on ratings

The self-reported effects that passengers had on rating averages for all car journeys were examined. Effects by number of passengers and effects by type of passenger were investigated separately.

The effects of the number of passengers on male and female car driver ratings were examined separately (Tables 3.15 and 3.16).

Table 3.15: Effects of passenger numbers on male car drivers

Male drivers	17-20			21-25			31-40		
Passengers	0	1	>=2	0	1	>=2	0	1	>=2
Ratings Risky	2.2	2.2	2.3	2.2	2.1	2.4	2.2	2.1	2.3
Enjoyable	4.4	4.6	4.7	3.9	4.3	4.3	3.9	4.3	4.3
Hurried	2.8	2.5	2.4	2.8	2.7	2.7	2.5	2.2	2.1
Tense	2.1	2.0	2.0	2.3	2.2	2.2	2.1	2.0	2.1
Tired	2.6	2.3	2.5	2.6	2.8	3.1	2.5	2.3	2.4
Concentration	5.1	5.2	5.1	5.3	5.1	4.9	5.4	5.4	5.4

Table 3.16: Effects of passenger numbers on female car drivers

Female drivers	17-20			21-25			31-40		
Passengers	0	1	>=2	0	1	>=2	0	1	>=2
Ratings Risky	1.9	2.1	2.1	2.1	1.9	2.1	1.8	2.1	2.0
Enjoyable	3.8	4.4	4.5	3.8	4.2	4.6	3.8	4.1	4.1
Hurried	2.5	2.3	2.4	2.7	2.5	2.6	2.8	2.5	2.3
Tense	2.2	2.0	2.3	2.4	1.9	2.3	2.2	2.4	2.3
Tired	2.5	2.3	2.5	2.7	2.7	2.4	2.6	2.7	2.7
Concentration	4.9	4.9	4.7	5.1	5.0	4.6	5.4	5.0	4.8

All groups, with the exception of the 17-20 female group, rated journeys with one passenger slightly less risky than when alone. Generally, having one passenger in the car slightly added to the enjoyment of the journey which was slightly less hurried. All groups were slightly less tense with one passenger in the car than when alone except the 31-40 year old female group who were perhaps more likely to be carrying children as their passengers.

The effect of two or more passengers showed that risk levels very slightly increased from the 'one passenger' or 'alone' conditions. Enjoyment levels of the journeys with two or more passengers were higher than 'alone' or with one passenger except for the male and female 31-40 year old groups. Concentration levels tended to fall slightly as passenger numbers increased for all groups except the 31-40 year old male group where they stayed about the same.

Journeys where there was only one type of passenger (either P=partner/spouse, C=children or F=friend) were examined (Tables 3.17 and 3.18). These three passenger types were chosen because, from the interview data, it became clear that these passenger types have the most effect on driver behaviour.

Table 3.17: Effects of passenger type on male car drivers

Male drivers	17-20			21-25			31-40		
Passengers	P	C	F	P	C	F	P	C	F
Ratings Risky	2.0	-	2.3	2.1	-	2.8	2.2	2.0	1.9
Enjoyable	4.8	-	4.7	4.3	-	4.3	4.3	3.9	4.3
Hurried	2.3	-	2.7	2.7	-	2.6	2.0	2.2	2.6
Tense	1.7	-	2.1	2.2	-	2.1	1.9	2.1	2.0
Tired	2.0	-	2.5	2.9	-	2.8	2.2	2.6	2.3
Concentration	5.3	-	5.0	5.0	-	5.1	5.5	5.1	5.2

Key: P= Partner/spouse
C= Children
F= Friend

Table 3.18: Effects of passenger type on female car drivers

Female drivers	17-20			21-25			31-40		
Passengers	P	C	F	P	C	F	P	C	F
Ratings Risky	2.0	-	2.2	1.7	2.5	1.8	2.0	2.0	2.2
Enjoyable	4.7	-	4.5	3.9	4.8	4.4	4.2	4.1	3.8
Hurried	2.0	-	2.5	2.6	3.0	2.4	2.5	2.5	2.3
Tense	1.7	-	2.2	1.8	2.6	1.9	2.3	2.4	2.2
Tired	2.4	-	2.4	2.9	2.8	2.6	2.7	2.8	2.5
Concentration	5.3	-	4.7	4.6	3.9	5.3	5.0	4.9	4.5

Key: P= Partner/spouse
C= Children
F= Friend

All groups, except the 31-40 year old male group, assessed journeys with friend(s) slightly more risky than with their partner or spouse. The largest differences were in the 17-20 and 21-25 year old male groups. All groups found it more enjoyable driving accompanied by their partner or spouse than friends or children except the female 21-25 year old group. Those groups that had carried unaccompanied children as passengers assessed these journeys as the most tense.

3.3.7 Discussion

The use of driving diaries allowed an enormous amount of information to be collected on driving patterns and behaviour. Much of the data was useful as an accurate measure of exposure and provided a check of the questionnaire data on reported driving patterns. Basic exposure details such as number of journeys, distance, time of day, passenger occupancy and so on ensured a good description of driving patterns across the age and sex groups was obtained. The high correlation between a number of the measures found on both the driving diaries and the questionnaire lends support and credence to studies which only employ one of these methods as a research tool.

A number of results from the diaries were predictable such as number of journeys and weekly mileage increasing with age. Greater amounts of night time driving by the younger age groups may also partly explain the higher accident involvement rates of younger drivers (Williams, 1984) and also their higher involvement in single vehicle accidents (McKenna, 1987), but does not help to explain the different accident involvement rates between male and female driver groups within the youngest groups, since the exposure of both groups to high risk night time driving would appear to be fairly similar. This finding is in contrast to that of Broughton (1988) who did find sex differences in exposure levels for night time driving; with male drivers driving a higher proportion of their total driving time at night.

Journey purpose characteristics which show that as age increases the proportion of driving time spent on leisure purposes decreases is important in the light of later results (see Section 6.5).

Similarly, the amount of time drivers, particularly the younger male drivers, spend with different types of passengers and/or listening to a radio cassette in the car is important given the extent of the effect on driving behaviour which is reported by young male drivers below (see Section 7.2 and 7.3).

Two practical difficulties arose through the use of the driving diaries. Firstly, despite the fact that very few of the diaries (<5%) were returned unsatisfactorily completed, subjects found them extremely time consuming to complete in the detail required. An abbreviated and more straightforward diary may be completed even more accurately by subjects.

Secondly, it is questionable whether the use of the rating scales on various measures concerned with the journey attributes such as level of risk, enjoyment and concentration was very satisfactory. The main problem being that each driver (or each driver group) has their own interpretation of risk, enjoyment and concentration and thus scores cannot be strictly compared. It is extremely difficult to determine what a score of 3 for concentration means assessed by a 31-40 year old when compared to a score of 5 by a 17-20 year old. In addition, it is impossible to devise as accurately as required a definition or base level of a particular rating which can be consistently used by all the subjects. Such base level 'anchoring' problems were evident in that drivers themselves admitted that they had real difficulties understanding and interpreting the rating system. It is arguable that such in-depth analysis and understanding of driving behaviour is not readily amenable to such relatively crude assessment measures and other alternative approaches are likely to produce a better understanding of such a complex phenomenon (see Chapters 5, 6 and 7).

3.4 Driver attitudes and opinions

A total of 350 drivers filled in the questionnaire. The other drivers who took part in the route survey were interviewed earlier in the study (N=86) and the results of these interviews helped form the basis of the questionnaire content. Thus, the more quantitative based questionnaire was derived from the more qualitative work of the early interviews.

Some of the questions on the questionnaire had open ended answers whilst others required forced choices (See Appendix A.5).

3.4.1 Learning to drive

3.4.1.1 Driving illegally on road before provisional licence

A number of drivers admitted having driven illegally on the road prior to obtaining a provisional licence. Almost a fifth of male drivers had driven illegally prior to obtaining their provisional licence compared to less than a tenth of female drivers.

Table 3.19: Drivers (%) who drove illegally prior to obtaining provisional licence. (N=50)

	Male			Female		
(% of drivers)	17-20	21-25	31-40	17-20	21-25	31-40
Drove illegally prior to provisional licence	19	16	25	12	16	1

(rounded to nearest percentage)

3.4.1.2 Attitudes to the driving test

On average, males took fewer lessons (16 lessons) to pass their driving test than women (22 lessons).

Opinions on the adequacy of the driving test varied greatly. The male drivers on average tended to rate the test as less adequate than the female drivers. However, for all groups the average rating was around 4, the mid-point mark, suggesting perhaps, that the test was assessed overall as 'adequate' (but see Discussion). None of the ratings between the driver groups were significantly different (Mann-Whitney, $Z = < 1.74$, $p > 0.05$) (see Appendix A.6).

Table 3.20: Rating of adequacy of test

	Male			Female		
	17-20	21-25	31-40	17-20	21-25	31-40
How adequate is the current driving test?	3.9	3.7	3.8	4.3	4.2	4.2
(Standard deviation)	(1.5)	(1.6)	(1.7)	(1.4)	(1.3)	(1.2)

(Average rating score with 1= Not at all...7= Completely)

Nevertheless, a number of ways were proposed for improving the driving test. Over half of the drivers stated that some form of motorway tuition or testing should be incorporated into the test. 37% of drivers suggested parking skills should be tested (which has been introduced since this study was completed) and 22% stated that the test should be longer than the current format. Around 10% of the drivers mentioned that there is no night driving in the test and a similar number suggested that a written test and basic car maintenance could be taught and tested. 5% of drivers suggested some compulsory lesson component prior to the driving test which could encompass some of these other ideas.

3.4.1.3 How does driving change after passing the test?

Drivers were asked whether or not they still drove in the same way as on their driving test. 91% of drivers claimed to drive differently: 22% claimed to drive better overall, 54% to drive worse overall, 13% to drive in a different way but not necessarily better or worse with the other 2% not indicating in what ways their driving had altered.

Of those 54% of drivers who claimed to drive worse, the ways that they drove worse varied. 46% thought they drove faster than they did on their test, 31% were worse at steering, 13% were worse at using mirrors, 8% were worse at gear changing and another 8% thought that they were too relaxed when driving.

3.4.2 Experience and other driver characteristics

The number of years of driving experience since passing the driving test was obtained from the questionnaire data. An estimate of the total mileage driven since passing the test was also made using the reported mileages over the last five years. These two measures were highly correlated ($r=0.64$, df.337, $p<0.01$). The correlation of total mileage with accident frequency (at $r=-0.12$, df.337) just reached the 5% level of significance, but was not significant when correlated with 'at fault' accident frequency ($r=-0.10$, df.337, $p>0.05$). Total driving years was more highly correlated ($r=-0.23$, df.337, $p<0.01$) with accident frequency and also reached significance with 'at fault' accident frequency ($r=-0.20$, df.337, $p<0.01$). Both had negative values indicating that lower accident frequencies were associated with greater total mileage or total driving years. Correlations of total mileage and total years with total UDAs and total dangerous UDAs were all significant (within range $r=-0.14$ to $r=-0.21$, df.337, $p<0.05$), with negative values again being found (see Appendix A.7 for correlation matrix).

The age groups of the drivers (group 1: 17-20 years, group 2: 21-25 years, group 3: 31-40 years) were correlated with the accident frequencies, with lower frequencies associated with group 2, but especially with group 3. Only with group 3 however, did the correlations reach significance with number of accidents ($r=-0.23$, df.337, $p<0.01$) and number of 'at fault' accident frequencies ($r=-0.20$, df.337, $p<0.01$). Similar, but lower correlations (with only age group 3 correlations again being significant) were found for the total UDA scores ($r=-0.12$, df.337, $p<0.05$) and total dangerous UDA scores ($r=-0.17$, df.337, $p<0.01$).

Driver sex did not give a significant correlation with either of the accident frequency measures (in range $r=-0.05$ to $r=-0.06$, df.337, $p>0.05$) or with total UDA scores or total dangerous UDA scores (in range $r=-0.05$ to $r=0.06$, df.337, $p>0.05$.).

3.4.3 Car choice

The attitudes to car choice was examined across the age and sex groups.

3.4.3.1 Importance of car type

Within the male and female groups, there were no significant differences between the ratings of the different age groups. However, across the sex groups, it was apparent that both the youngest male group (17-20 years) (Mann-Whitney, Z=-2.21, p<0.05) and the older male group (31-40 years) (Mann-Whitney, Z=-3.18, p<0.05) rated car type as more important than the corresponding female age groups (Appendix A.6). Therefore, in general, the male drivers placed greater importance on the type of car they drove than females (Table 3.21).

Table 3.21: Rating of importance of car type

	Male			Female		
	17-20	21-25	31-40	17-20	21-25	31-40
How important is the type of car that you drive?	4.7	4.8	5.2	3.9	4.5	4.0
(Standard deviation)	(1.7)	(1.6)	(1.8)	(1.8)	(1.5)	(1.9)

(Average rating score with 1= Not at all...7= Extremely)

3.4.3.2 Importance of car qualities

When split into the different attributes of cars, males tended to place more emiles/hasis than women on the importance of speed, acceleration and engine size when buying a car. Acceleration and speed also appeared to be correlated with age. As age increased, speed and acceleration tended to become less important factors and this was particularly marked for males (Table 3.22).

Table 3.22: Rating of importance of car qualities

Rating of importance of car qualities	Male 17-20	21-25	31-40	Female 17-20	21-25	31-40
Speed	4.6	4.2	4.0	4.0	4.2	3.3
Acceleration	5.2	4.7	4.6	4.2	4.5	3.8
Engine size	4.4	4.0	4.4	3.8	4.3	3.8
Comfort	5.3	5.2	5.7	5.2	5.4	5.5
Price	6.0	5.6	5.3	6.1	6.1	5.7
Reliability	6.2	6.3	6.4	6.4	6.7	6.9
Safety	5.4	5.6	6.2	6.4	6.3	6.7
Utility	4.6	4.7	5.6	5.3	5.1	5.3
Appearance	5.3	4.8	4.9	4.5	5.0	4.3

(Average rating score with 1= Not at all...7= Extremely)

For all the age and sex groups, comfort, price and reliability were the most important factors, reliability being of overriding importance for women as age increased.

The importance of safety increased with age for males but remained at a comparatively higher level for women regardless of age. Car appearance was more important overall for males than females with the 17-20 year old males giving this as high a priority as safety, a finding not replicated with any of the other age and sex groups.

3.4.3.3 Aspects of current car choice

As expected, price was the most important factor for all groups particularly younger drivers (Table 3.23). After price, appearance of the car was the most important priority for males whereas reliability was more important for females. The importance of safety was only indicated by the older 31-40 year old groups. This is an interesting finding because when asked of the importance of car qualities in the abstract, all groups rated safety a fairly high priority but when it came to actually choosing their own car, safety factors had a negligible part in the choice.

Table 3.23: Most important factor in current car choice

Most important factor in current car choice	Male 17-20	Male 21-25	Male 31-40	Female 17-20	Female 21-25	Female 31-40
Speed	-	-	3	-	-	-
Acceleration	-	-	-	-	-	2
Engine size	-	2	3	-	-	5
Comfort	-	4	6	-	14	5
Price	76	66	39	68	54	60
Reliability	2	11	10	14	14	14
Safety	-	-	13	-	-	7
Utility	-	4	13	9	9	5
Appearance	22	13	13	9	9	2
Total	100	100	100	100	100	100

(rounded to nearest percentage)

Drivers' ratings of the importance of certain qualities when buying a car seem to fall into fairly distinct groups. The overall importance of the type of car, its speed, acceleration and engine size were all quite highly correlated (in range $r=0.40$ to $r=0.76$, df.339, $p<0.01$). Safety and reliability were also correlated significantly ($r=0.18$, df.339, $p<0.01$). Price correlated with all the other qualities (in the range $r=0.23$ to $r=0.34$, df.339, $p<0.01$), apart from reliability ($r=0.01$, df.339, $p>0.05$), emiles/hasising the overall importance of this quality (price) when buying a car.

Correlation of the importance ratings with accident frequency ($r=0.13$, df.339, $p<0.05$) and 'at fault' accident frequency ($r=0.11$, df.339, $p=0.05$) showed positive correlations with acceleration and negative correlations with safety, which was significant at the same 5% level for both accident frequency measures ($r=-0.12$, df.339. $p<0.05$). This implies higher 'at fault' accident frequency for those drivers who gave higher importance to acceleration and lower 'at fault' accident frequency for those who rated safety as important.

3.4.3.4 Aspects of ideal car choice

With ideal car choice, appearance was the most important factor for all age and sex groups (Table 3.24).

Table 3.24: Factors in ideal car choice

Most important factor in ideal car choice	Male 17-20	Male 21-25	Male 31-40	Female 17-20	Female 21-25	Female 31-40
Speed	7	12	12	12	15	8
Acceleration	16	5	1	4	5	5
Engine size	6	-	9	4	1	5
Comfort	9	13	13	8	16	8
Price	7	11	3	9	8	6
Reliability	12	11	12	6	9	14
Safety	4	5	12	2	4	12
Utility	8	14	14	13	9	12
Appearance	31	29	24	42	33	30
Total	100	100	100	100	100	100

(rounded to nearest percentage)

Speed and acceleration were important for all groups but particularly the 17-20 year old male group. Comfort, reliability and utility were also mentioned, as was safety, the importance of which increased with age across sex. Again, although safety is seen as an important factor *per se*, it would appear to not have as high a priority when it comes to a criterion for one's ideal car, this is particularly true for the younger age groups.

3.4.4 Reported effects of passengers

Data presented in the following sections (3.4.3.1 - 3.4.3.5) on passenger effects are limited and therefore a theoretical consideration of car driver/passenger effects is given in Chapter 7, where the topic is explored in greater detail.

3.4.4.1 Overall effects of passengers

Drivers were asked to rate on a seven point scale whether having passengers in the car affected their driving style. The continuous rating scale went from 1= not at all to 7= a lot (see Table 3.25). The 17-20 year old male group gave the highest rating for passenger effects which reached a significant level when compared to the male 21-25 year old group (Mann-Whitney, $Z=-3.18$, $p<0.01$) and the female 17-20 year old group (Mann-Whitney, $Z=-2.57$, $p<0.05$). However, such measures could not determine whether passenger presence was a beneficial or adverse effect on driving and thus little could be drawn from this, except to state that the youngest male group of drivers reported the most passenger presence influence. Female differences were not significantly different (Mann-Whitney, $Z<0.98$, $p>0.05$) (See Appendix A.6).

Table 3.25: Effects of passengers on car driving

	Male			Female		
	17-20	21-25	31-40	17-20	21-25	31-40
Passenger effect	4.2	3.2	3.6	3.3	3.5	3.7
(Standard deviation)	(1.8)	(1.8)	(1.9)	(1.7)	(1.6)	(1.9)

(Average rating score with 1= Not at all...7= A lot)

The findings were further examined to show what effect different types of passenger had on driving behaviour. The effects were combined initially into two broad categories. Firstly, passenger effects which made the driver drive worse than if driving on their own. In this group, effects where the driver stated that they either drove worse, faster, less safely, with less concentration or with more nerves than usual were included. The second category included passenger effects which made the driver drive better than when on their own. Included in this group were effects where the driver stated that they drove better, slower, safer or concentrated more.

There were three types of passengers (friends, children and partner/spouse or boyfriend/girlfriend) that appeared to adversely affect driving behaviour. These effects were different across driver age and sex groups.

There were also three types of passengers (parent, children and partner/spouse or boy/girlfriend) that appeared to improve driving behaviour more than the other passenger types or passenger combinations. These effects also varied between the different driver groups.

3.4.4.2 Effects of friends

35% of 17-20 year old males indicated that their driving was adversely affected by the presence of friends in the car. This was over 10 percentage points more than the next most affected groups namely 21-25 year old males and 21-25 year old females (Table 3.26).

Table 3.26: Drivers (%) affected by friends as passengers.

Passenger type	Male			Female		
Friends	17-20	21-25	31-40	17-20	21-25	31-40
Adversely affected	35	16	8	16	24	11
Positively affected	13	9	2	16	11	7

(rounded to nearest percentage)

The presence of friends as passengers seems adversely to affect 17-20 year old males more than any of the other groups. However, it would appear that the presence of friends can also have a beneficial effect on driving behaviour. Again, this effect was most marked for the younger age groups. No distinction was made as to the sex of the friends as passengers in the car. It may be the case that different effects (ie beneficial or negative) are dependent on the sex or other characteristics of the passenger. Such detail merited further consideration and this is reported in Section 7.2 below.

3.4.4.3 Effects of children

16% of 31-40 year old females and 6% of 31-40 year old males indicated that their driving was adversely affected by the presence of children in the car. The low rate amongst the younger age groups probably reflects the lower proportion who drive regularly with children as passengers (see Section 5.2.6).

Table 3.27: Drivers (%) affected by children as passengers.

Passenger type Children	Male 17-20	Male 21-25	Male 31-40	Female 17-20	Female 21-25	Female 31-40
Adversely affected	-	1	6	2	2	16
Positively affected	11	7	7	10	2	33

(rounded to nearest percentage)

All groups (except the 21-25 year old female group) indicated their driving was more likely to be improved by the presence of children in the car.

The presence of children can lead to either improved or worse driving behaviour. This is probably linked to whether the driver is able to concentrate fully on the driving situation. The interviews suggested that parents deliberately slow down when they have children in the car because they feel particularly responsible for their well-being and are also aware that children can sometimes be a distraction.

3.4.4.4 Effects of partner/spouse or boy/girlfriend

23% of 31-40 year old females and 12% of 21-25 year old females indicated that their driving was adversely affected by the presence of their partner/spouse or boy/girlfriend in the car.

Table 3.28: Drivers (%) affected by partner/spouse or boy/girlfriend as passengers

Passenger type Partner/spouse	Male 17-20	21-25	31-40	Female 17-20	21-25	31-40
Adversely affected	2	4	1	9	12	23
Positively affected	27	21	11	13	15	5

(rounded to nearest percentage)

27% and 21% of drivers in the 17-20 year old and 21-25 year old male groups reported that their driving was improved by the presence of their partner/spouse or girlfriend in the car. Indeed, 21% of male drivers reported driving better when accompanied by their partner/spouse or girlfriend compared to just under 11% of female drivers when accompanied by their partner/spouse or boyfriend.

It would seem that for males their driving, if affected at all, is more likely to improve when accompanied by their partner/spouse or girlfriend, but that the reverse is true for females, particularly for older females (31-40 year olds).

3.4.4.5 Effects of parents

Over half of the drivers in the 17-20 year old male and female groups indicated their driving was improved by the presence of a parent in the car. 34% and 44% of the 21-25 year old male and female groups also stated that having a parent as a passenger led to improved driving (Table 3.29). The lower percentages evidenced in the older age groups may be due to this group having fewer parents still alive.

The reasons given for the changes in driving style when accompanied by parents varied across age. The younger groups' (17-20 and 21-25 years) most common reason for improved driving with their parents present was that they wanted their parents to think that they drove safely whereas the older 31-40 year old age groups most commonly stated that they drove more carefully with their parents in the car because they were old or in poor health. Around 10% of the 17-20 and 21-25 year old female groups were adversely affected by their parents in the car. No differentiation was made between sex of parent present.

Table 3.29: Drivers (%) affected by parents as passengers.

Passenger type Parents	Male 17-20	 21-25	 31-40	Female 17-20	 21-25	 31-40
Adversely affected	-	3	2	10	11	7
Positively affected	56	34	23	51	44	20

(rounded to nearest percentage)

3.4.5 Reported effects of radio cassette

All age and sex groups listened to the radio cassette for a large proportion of the time that they were driving (Section 3.3.4).

Drivers were asked to rate on a continuous seven point scale the degree to which listening to the radio cassette affected their driving behaviour in any way. The rating scale went from 1= not at all to 7= a lot. The average rating by age and sex group is shown (Table 3.30). There were no significant differences between the male rating scores (Mann-Whitney, $Z=<-1.07$, $p>0.05$) and only one significant female result, with the 21-25 year old female group of drivers reporting a significantly greater effect than the 31-40 year old female group (Mann-Whitney, $Z=-3.16$, $p<0.01$). Across driver sex groups, the only significant difference was that the 21-25 year old female group rated the radio cassette as having a more significant effect than the corresponding male age group of drivers (Mann-Whitney, $Z=2.08$, $p<0.05$) (see Appendix A.6).

Overall, each age and sex group rated the radio cassette as having some effect on car driving behaviour, but this effect was not large, and did not vary greatly across driver age and sex group. Again, this rating did not distinguish between beneficial or adverse effects on driver behaviour.

Table 3.30: Effect of radio cassette on car driving

	Male 17-20	Male 21-25	Male 31-40	Female 17-20	Female 21-25	Female 31-40
Radio cassette effect	2.8	2.7	2.7	2.9	3.4	2.4
(Standard deviation)	(1.6)	(1.7)	(1.7)	(1.8)	(1.9)	(1.9)

(Average rating score with 1= Not at all...7= A lot)

The particular types of effect that the radio cassette had on car drivers were examined. The percentages within each age and sex group that stated that the radio cassette helped or hindered their driving is shown (Table 3.31). Effects that were categorised as positive benefits to driving were keeping the driver awake, relieving boredom, calming mood in traffic jam, relaxing mood to drive slower, helping concentration and informing on traffic conditions. Effects that were categorised as hindering driving included concentrating less, turning the tape over and driving to the tempo of the music.

Table 3.31: Drivers (%) affected by radio cassette whilst driving

Radio cassette effect	Male 17-20	Male 21-25	Male 31-40	Female 17-20	Female 21-25	Female 31-40
Positive effect	14	23	27	24	29	20
Adverse effect	49	46	29	33	49	16

(rounded to nearest percentage)

It is not possible to add up the two percentages for each age and sex group to determine the combined effect (whether positive or negative) of the radio cassette because these figures are not necessarily exclusive. In some circumstances, the radio cassette was reported to have a positive benefit on driving and in others to be detrimental. However, it would appear that the radio cassette had an adverse effect on more younger drivers (< 26 years) of both sexes than it did a positive benefit, whilst for older drivers (31-40 years) the adverse and positive effects evened out. These age differences may have been related to difference in type of listening. Again, further work on this topic is reported below (Section 7.3).

3.4.6 Perceived danger of different road types and conditions

Drivers were asked to rate on a seven point continuous scale how dangerous they found a number of different road types. The average of these ratings across age and sex is shown (Table 3.32). The rating scale was from 1= not at all dangerous to 7= extremely dangerous.

Females rated motorways and rural roads as being slightly more dangerous than males did, which may relate to their lower level of use of such roads.

Table 3.32: Average rating of dangerous road types

Road types	Male			Female		
	17-20	21-25	31-40	17-20	21-25	31-40
Motorways	3.6	3.5	3.8	4.2	4.4	4.5
Dual carriageways	3.6	3.5	4.1	3.7	3.9	4.2
Rural roads	4.1	4.1	3.9	4.7	4.6	4.1
Urban roads	3.9	4.0	4.0	3.8	3.9	3.6

(Average rating score with 1= Not at all...7= Extremely)

Drivers were asked to rate on an identical scale to that above how dangerous they found a number of different road situations. The average of these ratings across age and sex group is shown (Table 3.33).

Table 3.33: Average rating of dangerous road situation

Road situations	Male 17-20	Male 21-25	Male 31-40	Female 17-20	Female 21-25	Female 31-40
Roundabouts	3.5	3.5	3.5	3.6	4.1	3.7
Joining motorway	4.3	4.0	4.1	4.7	4.8	4.8
Right turns	3.4	3.4	4.0	3.2	3.8	3.8
Left turns	2.0	2.1	2.5	2.2	2.4	2.1
Traffic lights	2.3	2.5	3.0	2.1	2.4	2.6

(Average rating score with 1= Not at all...7= Extremely)

With the exception of the ratings of motorways and urban roads, all of the road types and road situation ratings were quite highly correlated (in range $r=0.13$ for urban roads and 'joining motorway' manoeuvre, to $r=0.61$ for motorways and dual carriageways, df.340, $p<0.01$). However, none of the ratings reached a significant level of correlation with either of the measures of accident frequency (in range $r=0.01$ urban roads to $r=-0.10$ motorways, df.340, $p>0.05$).
For total UDAs, the correlations of perceived level of danger on urban roads ($r=-0.14$, df.340, $p<0.05$), with right turns ($r=-0.11$, df.340, $p=0.05$) and at traffic lights ($r=-0.12$, df.340, $p<0.05$) just reached the significance level and were all negative, implying lower UDA scores for those drivers who considered these situations were more dangerous. For total dangerous UDA scores, the only significant correlations were joining motorway manoeuvres ($r=-0.12$, df.340, $p<0.05$) and right turns ($r=-0.11$, df.340, $p<0.05$), with the direction once again being negative. Examination of accident statistics suggest that a number of these road types and manoeuvres do indeed have a high number of accidents. For example, more vehicles are involved in right turn accidents than any other type of vehicle manoeuvre (with the exception of other/straight ahead) (Department of Transport, 1991) and traffic signals are also a problem area (Hall, 1986) with 20,790 injury producing accidents at the 8,500 junctions controlled by traffic lights in GB in 1989 (Lawson, 1991). More vehicles are involved in accidents on built-up roads than non-built up roads in absolute terms, but the reverse is true

when the fatal accident rate per 100 million kms is examined (Department of Transport, 1991).

3.4.7 Reported accidents and convictions

The total number of accidents and the total number of accidents reported to be the driver's own fault for each age and sex group were divided by the average number of years a full licence had been held. This enabled the average number of accidents and 'own fault' accidents per driver per year to be ascertained (Table 3.34).

Table 3.34: Number of accidents and 'own fault' accidents (average) per driver per year

	Male			Female		
	17-20	21-25	31-40	17-20	21-25	31-40
Number of 'accidents' per driver per year	0.49	0.30	0.14	0.47	0.21	0.09
(Standard deviation)	0.57	0.36	0.14	0.38	0.29	0.12
'Own fault' accidents per driver per year	0.35	0.15	0.06	0.29	0.13	0.03
(Standard deviation)	0.61	0.91	0.09	0.82	0.20	0.06

These results indicate that, on average, 35 in every 100 17-20 year old male drivers would have an 'own fault' accident per year compared to only 3 or 6 in every 100 drivers in the 31-40 year old female and male groups. It would appear that within the sample, on average, the male, 17-20 year old age group was around four times as likely to have an accident per year as the 31-40 year old age group. In addition, it should be noted that a higher proportion (75%) of all accidents that the youngest male group were involved in, were reported to be 'own fault' accidents than any of the other age and sex groups.

An ANOVA showed a significant AGE effect across the groups ($F=13.971$, $df=2,336$; $p<0.01$) but no SEX effect ($F=0.732$, $df=1,336$; $p>0.05$) or AGE/SEX interaction effect ($F=0.144$, $df=2,336$; $p>0.05$) for the number of accidents per year (NACY) measure. AGE ($F=11.848$, $df=2,336$; $p>0.01$) also reached statistical significance with the 'at fault' accident frequency (NFAY) measure, but again SEX and the AGE/SEX interaction did not (see Appendix A.6). These results confirm that younger drivers are significantly more likely to be involved in accidents and 'at fault' accidents per year than older drivers. Number of accidents per year and number of 'at fault' accidents per year were correlated ($r=0.83$, df.340, $p<0.01$) suggesting that either measure could be used as an adequate measure of driver accident history (see Appendix A.7).

The average number of convictions per driver per year is shown (Table 3.35). A similar pattern to the 'own fault' accident average per year was produced, with the exception being that the 17-20 year old females had a much lower average number of convictions. This finding <u>may</u> be explained by female drivers performing fewer driver violations than male drivers, the greater frequency of which, are, perhaps, more likely to lead to higher numbers of convictions.

Table 3.35: Number of convictions (average) per driver per year

	Male			Female		
	17-20	21-25	31-40	17-20	21-25	31-40
Number of convictions per driver per year	0.06	0.06	0.02	0.005	0.04	0.007
Standard deviation	0.28	0.14	0.07	0.05	0.06	0.02

An ANOVA showed no significant AGE effect ($F=2.918$, df.2,336; $p>0.05$) nor an AGE/SEX interaction effect ($F=1.154$, df.2, 336; $P>0.05$), but the SEX effect was significant ($F=4.332$, df.1,336; $p<0.05$) (see Appendix A.6) suggesting that male drivers have significantly more driver convictions per year than female drivers. The number of convictions per year did not correlate significantly with either of the accident frequency measures nor the total UDA or total dangerous UDA score (in range $r=-0.03$ [total UDAs] to $r=0.09$ [accident frequency], df.340, $p>0.05$). These results suggest that driver self-reported convictions are not linked strongly to driver self-reported accident history or performance indicators on the route survey.

3.4.8 Reported errors and violations

Drivers were asked to rate how frequently they performed each of fourteen different driver actions, borrowed from Reason *et al.* (1989) (Appendix A.5, Q.30). Seven of these driver actions were categorised as driver errors (i.e. unintentional). No further differentiation of driver errors into mistakes, slips or lapses was attempted. These driver errors were: a= attempt to drive away from stationary in wrong gear; c= forget that your lights are on full beam; e= misjudge a gap in a car park and nearly (or actually) hit an adjacent vehicle; g= switch on lights when intending to turn on wipers and vice versa; i= forget which gear you are in and have to check with your hand; k= misjudge speed of oncoming vehicle when overtaking; n= miss your exit on a motorway and have to make a lengthy detour. The other seven driver actions were categorised as driver violations (i.e. intentional). These driver violations were: b= deliberately park on a double yellow line; d= become impatient with a slow driver in the outer lane and overtake on the inside; f= deliberately disregard speed limits late at night or early in the morning; h= take a chance and cross on traffic lights that have just turned red; j= 'race' oncoming vehicles for a one-car gap on a narrow or obstructed road; l= drive when you realise you may be over the blood alcohol limit; m= get involved in unofficial 'races' with other drivers. The ratings went from 1 = Never to 7 = All the time. The averages of these ratings across age and sex group for the seven error and seven violation actions (combined) are shown (Table 3.36).

Table 3.36: Average error and violation scores

	Male			Female		
	17-20	21-25	31-40	17-20	21-25	31-40
Error scores	2.0	1.8	1.9	2.2	2.3	2.0
Violation scores	2.5	2.6	2.1	2.1	2.6	1.9

(Average rating score with 1= Never...7= All the time)

Within sex groups, all the male groups admitted committing more violations than errors whereas two of the female groups (17-20 and 31-40 year olds) admitted more errors than violations. Both errors and violations were lowest for the 31-40 year olds of both sexes suggesting that they tended to decrease slightly with age. Between sex groups, male drivers admitted fewer errors but more violations than female drivers. An ANOVA revealed some statistical differences between the age and sex groups for a number of the error and violations (see Appendix A.6). These analyses broadly showed that SEX differences were more marked with the error scores (particularly driver errors i= forget which gear in [$f=15.03$, df.2,337, $p<0.01$] and c= forget lights are on full beam [$f=5.008$, df.2,337, $p<0.01$]) and AGE differences more marked with the violation scores (particularly f=deliberately speeding late at night [$f=9.565$, df.2,337, $p<0.01$] b= deliberately parking on double yellow lines [$f=7.237$, df.2,337, $p<0.01$] and h= take a chance and deliberately cross red traffic lights [$f=6.394$, df.2,337, $p<0.01$]). These results suggest that female drivers admit to more driver errors than males and that younger drivers admit to more violations than older drivers.

The frequency ratings for each of the reported driving actions were generally fairly well correlated. It is quite evident, however, that the seven actions which may be regarded as violations have much higher correlations with each other than with the actions which are just errors of driving (see above for definitions), suggesting that violations and errors are distinct types of UDAs. Correlations between driver violations were all significant except 'race for a gap' and 'drink driving' ($r=0.07$, df.340, $p>0.05$). The level of significance for the other violation ratings was high (in range $r=0.47$ for 'overtaking on inside' and 'speeding late at night' to $r=0.11$, df.340, $p=0.05$ for 'drink driving and 'speeding late at night'). Drink driving was the violation behaviour which was least well correlated with the other violation behaviours, the notable exceptions being the correlation with 'parking on double yellow lines' (0.23, df.340, $p<0.01$) and 'crossing red traffic lights' ($r=0.35$, df.340, $p<0.01$) which were highly significant (arguably because these three actions represent the most extreme or obvious types of violation). Alternatively, these results might suggest that drivers are less willing to admit to drink driving behaviour.

Correlations between just the driving error actions were mainly significant and in the range $r=0.29$ (df.340, $p<0.01$) for 'need to check gear' and 'misjudge speed when overtaking' to $r=0.11$ (df.340, $p=0.05$) for 'need to check gear' and 'use wrong switches'. The only exception to this was the correlation between 'wrong gear used' and 'miss motorway exit' which was not significant ($r=-0.02$, df.340, $p>0.05$).

Nearly all of the action ratings correlated with accident frequency close to or above the 5% significance level. The exceptions were actions (a) (driving away in wrong gear, $r=0.01$, df.340), (g) (use wrong switches, $r=-0.06$, df.340), (j) (race for a gap, $r=0.05$, df.340) and (l) (drive after drinking, 0.01), which were far from significance. The highest correlations were for action violation (m) (racing with other drivers, $r=0.15$, df.340, $p<0.01$) and action violation (h) (crossing red traffic signal, $r=0.15$, df.340, $p<0.01$) both of which were positively correlated suggesting higher accident frequency for those drivers who perform these manoeuvres most frequently.

Extremely similar action rating correlations were found with 'at fault' accident frequency and total UDA scores, but correlations with total dangerous UDAs were much lower (see Appendix A.7).

3.4.9 Discussion

There were many important findings from the questionnaire data. The finding that as many as one-fifth of all male drivers had driven on the road prior to obtaining their provisional licence suggests that this is a serious, and possibly widespread, problem which merits further study. These figures tend to confirm those of Williams *et al.* (1984) that a high proportion (38%) of high school students drove alone illegally with only a 'learner permit' (provisional licence). Driver age at the time of the illegal on road driving was not recorded but under-age car driver statistics suggest that some proportion of these drivers may have been under 17 years at the time of the offence (Broughton, 1988).

In Section 3.4.1.2, it was reported that generally drivers assessed the DTp driving test as 'adequate', since a mid point mark was the average rating. However, this interpretation may not be entirely correct. A mid point marking such as this may sometimes reflect that the drivers found the question difficult or impossible to answer. For example, what criteria were they to use for the assessment? Is the test still the same as when they took it? Could they remember the (details of the) test and so on. Such an example illustrates one of the difficulties with forced choice questionnaire work, which an interview situation might be able to clarify.

A recognised determinant of the success of any traffic safety intervention is the degree to which the public accepts the new measure. The data show that motorway tuition might find favour amongst the public as one element of driver tuition or testing. There are real practical difficulties here in that not all parts of the country are situated within easy reach of a motorway and so it is unlikely that any compulsory motorway tuition would be introduced. Nevertheless, it might be recommended that some faster driving on dual carriageway be incorporated during driver tuition.

It was shown that all driver groups recognise the importance of car safety *per se*, but are not particularly interested in it, or at least safety does not seem to have a high priority when it comes to actually choosing a car except for the older 31-40 year old driver groups. Such a finding may reflect lifestyle changes and the maturation process whereby older drivers are more likely to have additional responsibilities such as families and children and where safety therefore becomes more of a priority (see also Section 6.2). The younger male driver groups assessed car appearance as important as safety which suggests that for many drivers in this group the car is more than just a means of transport (see Section 6.5). Findings related to car choice characteristics may also be influenced by media effects, if any, on driver behaviour (See Section 6.7). Kraus and Anderson (1991) report that motorcycle-type classification of USA accidents show a link between 'racing' motorcycles and higher accident involvement levels. They suggest that the advertising of 'racing' motorcycles may contribute to this finding.

The influence of passenger effects on driving behaviour was shown. A full discussion of the findings of passenger effects in this study is reported in Section 7.7 after more detailed passenger research has been presented (Section 7.2).

Errors and violation ratings followed an expected pattern, in that men reported fewer errors but more violations than women. Violation ratings were shown to be correlated positively to self-reported accident rates and are likely to be a better predictor than error ratings. It would have been extremely interesting to analyse the reported types of errors and perhaps, more pertinently, violations (due to their higher correlation with accident rates) against type of reported accident, however, these data were not recorded. The error/violation distinction was not a major part of this study; nevertheless results, albeit on a limited scale, would appear to support other more detailed work (Reason *et al.*, 1991).

3.5 Multivariate analysis

The previous section has provided some useful guidance as to how many of the variables relate to each other as isolated pairs. The objective of the analysis described in this section was to explore simultaneously the relative effects of all potentially useful variables, which may explain the different levels of self-reported 'at fault' accident frequency among drivers. Models of accident frequency and UDA scores were performed, but were broadly similar to that of 'at fault' accident frequency and therefore are not reported at length. 'At fault' accident frequency was judged, in methodological terms, to be a better measure than overall 'accident frequency' and neither UDA scores or dangerous UDA score models were as well fitting as the model for 'at fault' accident frequency. However, variables which appeared in these other models and which did not appear in the 'at fault' accident frequency model are reported briefly below (Section 3.5.8).

The generalized linear modelling technique which is a form of multiple regression analysis (Numerical Algorithms Group, 1986), was used to derive the most suitable relationships between the accident frequencies or UDA totals and functions of the explanatory variables of driver performance, attitude and behaviour. Further details of the method are given in Appendix A.9.

3.5.1 The form of the relationship

The relationship fitted for 'at fault' accident frequency was of a multivariate form as follows:

$A = k\, M^m \exp(\Sigma\, c_i V_i)$ where:

A is the average number of accidents per year for a driver
M is the estimated average mileage (1000s) per year for a driver.
It was calculated as:

$$\frac{\text{(estimated total mileage since passing test)}}{\text{(number of years since passing test)}}$$

V_i are the various explanatory variables of driver experience, age group, sex, performance, attitude and behaviour
k, m, c_i, are parameters estimated by the regression procedure.

The variable M is included as the measure of exposure to accidents and is expressed as an annual average mileage in order to balance with the annual average accident frequency. The form of the model also ensures that zero accidents are predicted for zero mileage.

3.5.2 Fitting procedure

The model was fitted in a step-by-step procedure, starting with the 'null' model which simply fits the mean 'at fault' accident frequency. As further variables were included, the number of drivers on which the model was based tended to reduce since there were missing values for different variables for some of the drivers and the model could be based only on those drivers for which data were available for all variables. The first variable to be included was the exposure variable, M, so that the effect of different levels of mileage per year could be taken into account and this was highly significant. The age group factor (AGE), and sex factors (SEX) were then added. AGE was significant but SEX and the AGE.SEX interaction were not significant. This was expected since the age group of the driver (group 1: 17-20 years, group 2: 21-25 years, group 3 : 31-40 years) had shown significant correlations with the 'at fault' accident frequency, with a lower frequency (ie fewer accidents) associated with group 2 but especially group 3, whilst driver sex did not give a significant correlation with either of the accident frequencies or UDA scores (reported above).

Two measures of experience were then used. These were the number of years of driving, YRS, and the driver's estimated total mileage (in thousands) since passing the test, MLS. Various functions of each variable, V, of the form aV, V^a and a/(V+b) (where a and b are constants) were tried, but when added to the model by themselves none of these was significant. However, when the interaction term with AGE was also included with the experience variable, a highly significant improvement of the model was obtained. This showed that the effect of experience was significantly different for the three age groups. Years of experience (YRS) was also a much better explanatory variable than total mileage (MLS) in explaining difference between the age groups, so YRS and YRS.AGE were added into the model. The MLS.SEX interaction was not significant for the 'at fault' accident frequency model, so SEX was dropped from the model.
The average frequency for driver violations (ACTV) proved to be the most significant of all the variables of driver performance, attitude and behaviour. The

average of the observers' ratings of the driver's performance (OASSA) was the next most significant variable. Five further variables were then found to be significant when added in turn to the model. These were as follows:-

STU, a factor indicating whether the driver was a student or not (i.e. SEG 7)
CONF5, a factor indicating whether the driver continually made indicator UDAs
CONF13, a factor indicating whether the driver continually drove too fast
CARU1, proportion of car use for work purposes
SHAR5, proportion of driving time with friends as passengers

The best combination of these variables was to add both CONF13 and SHAR5 into the model. The resulting model was very well fitting and accounted for some 92% of the explainable variation and so was better than the model for total accident frequency (77% of explainable variation).

3.5.3 The resulting model for 'at fault' accident frequency

The model for 'at fault' accident frequency, F, is given by:

$$F = 0.266\ M^{0.40}\ a\ e\ \exp(cYRS + 0.324\ ACTV - 0.241\ OASSA + 0.862\ SHAR5)$$

where:

M = average mileage (in thousands) per year
a = 1.000 for age group 1 (17-20 years)
= 0.073 for age group 2 (21-25 years)
= 0.056 for age group 3 (31-40 years)
c = -0.633 for age group 1
= 0.184 for age group 2
= 0.028 for age group 3
YRS = the number of years (and part years) since passing the driving test
ACTV = average frequency rating (on scale 1 to 7) for driver violations
OASSA = the average of the observers' six assessment ratings (on scale 1 to 7) of general performance, safety, anticipation, concentration, observation and car control.
SHAR5 = the proportion of driving time with friends as passengers
e = 1.441 for drivers who were observed continually to be driving too fast (factor CONF13)
= 1.0 otherwise

3.5.4 Model predictions of 'at fault' accident frequency

In order to examine the effects of exposure (M), experience (YRS) and age group it was convenient to set the other variables in the model to suitable values close to the mean values as follows:-

ACTV = 2, OASSA = 4, SHAR5 = 0.16 and also set e = 1.0. The model then becomes $F = 0.223\, M^{0.40}\, a \exp(cYRS)$

3.5.5 The effect of exposure (miles per year)

The number of years of driving experience since passing the driving test was obtained from the questionnaire data. An estimate of the total mileage driven since passing the test was also made using the reported mileages over the last five years. These two measures were highly correlated ($r=0.64$, df.337, $p<0.01$). The correlation of total mileage with accident frequency (at $r=-0.12$, df.337, $p<0.05$) just exceeded the 5% level of significance, while total years was more highly correlated ($r=-0.23$, df.337, $p<0.05$). Both had negative values indicating that lower accident frequencies were associated with greater total mileage or total driving years. Similar correlations were found with total UDAs and total dangerous UDAs. 'At fault' accident frequency increases with exposure, M, at a rate slightly below a square root relationship, the exponent of M being 0.43. Figure 3.9 shows the predicted effect of exposure on 'at fault' accident frequency for the following combinations:

A1: Age group 1 (17-20 years) and 1 years' experience.
A3: Age group 1 (17-20 years) and 3 years' experience.
B1: Age group 2 (21-25 years) and 1 years' experience.
B8: Age group 2 (21-25 years) and 8 years' experience.
C1: Age group 3 (31-40 years) and 1 years' experience.
C20: Age group 3 (31-40 years) and 20 years' experience.

The figure shows the 'at fault' accident frequency increasing with exposure and the youngest age group (17-20 years) with only one years' experience, to have clearly the greatest rate of increase. The rate of increase for this group was over 5 times that of the 21-25 year olds and over 9 times that of the 31-40 year olds, both with the same one years' experience. With 3 years' experience, the 'at fault' accident frequency for the 17-20 year olds was over 70% lower compared with the same age group with only one years' experience.

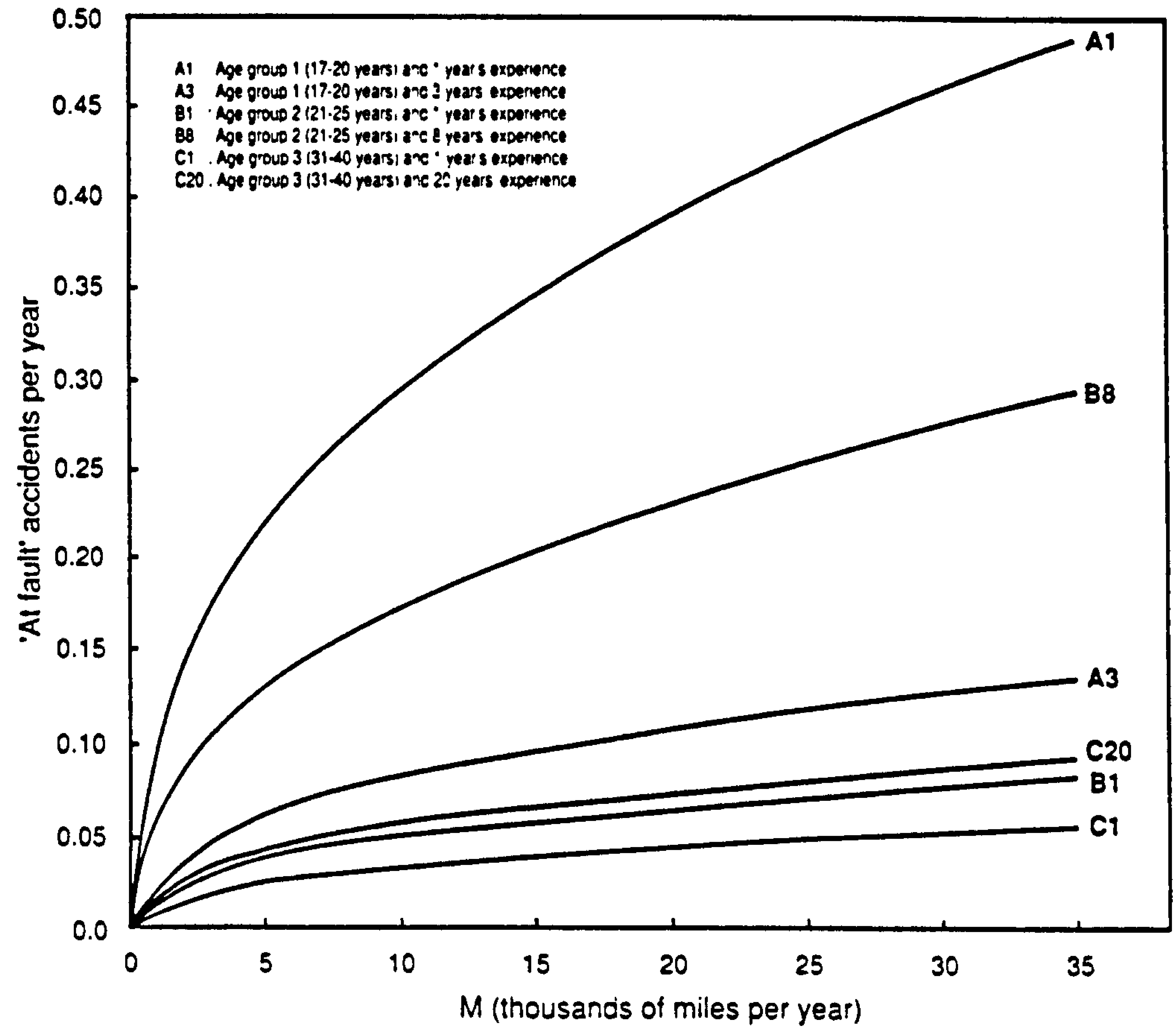


Figure 3.9: The predicted effect of exposure on 'at fault' accident frequency

For the 21-25 year age group, increased experience gave rise to much greater levels of 'at fault' accidents, with the frequency for those with 8 years' experience being some 3.5 times that for those with just 1 years' experience. For the oldest group (31-40 years) accident frequencies were comparatively low, and increased experience was associated with only slightly higher rates of increase.

3.5.6 The effect of experience

For illustrative purposes only, an average exposure of 10,000 miles per year was assumed, to provide directly comparable relationships of 'at fault' accident frequency with years of experience for the three age groups. It is recognised that male mean mileage rates were slightly higher than this figure and female mean mileage rates slightly lower, but use of one value was essential to provide comparable relationships. This is shown in Figure 3.10.

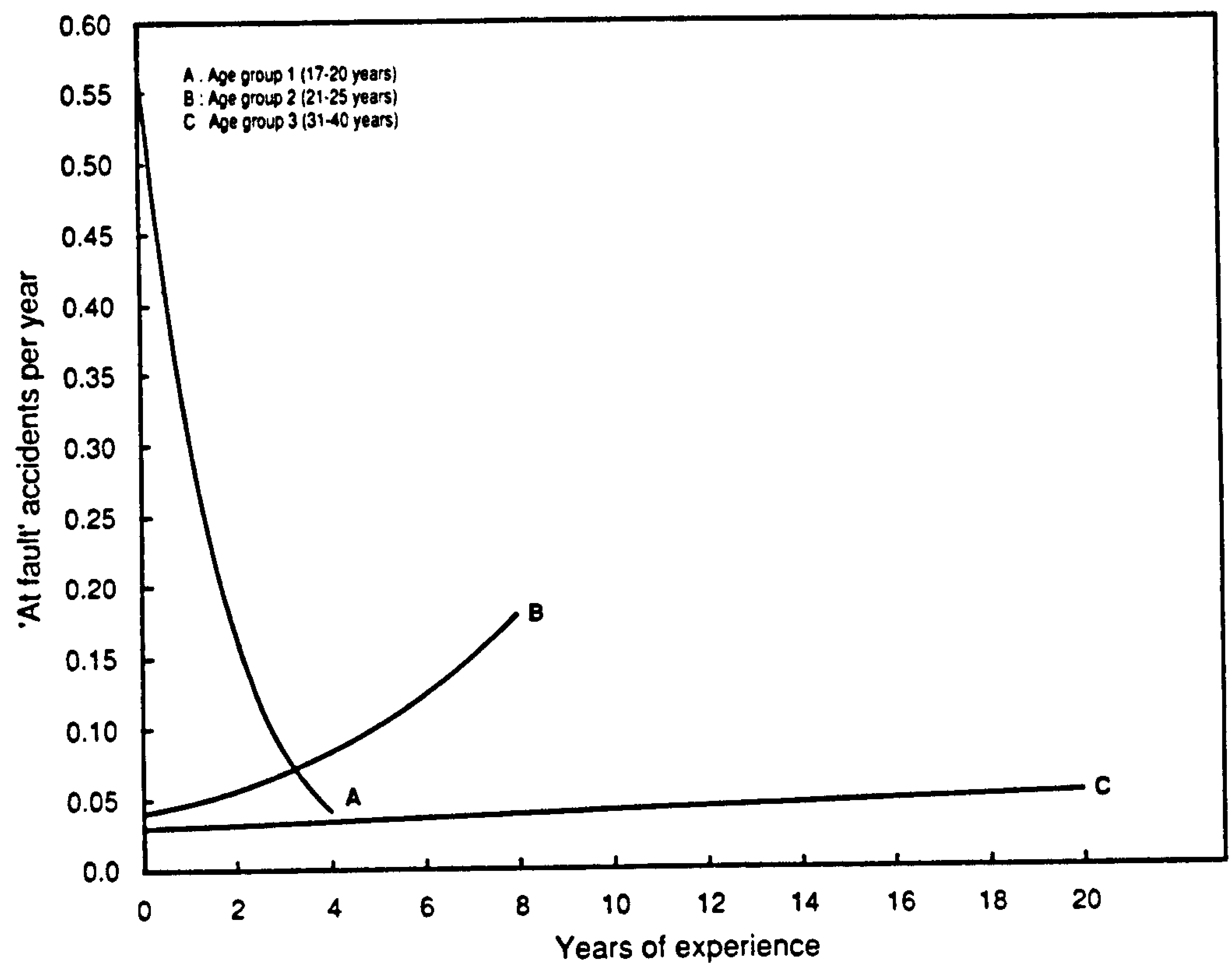


Figure 3.10: The predicted effect of experience on 'at fault' accident frequency

The figure shows that for the 17-20 year olds with little experience, 'at fault' accident frequency was high but falls rapidly as experience is gained. The 21-25 year olds had a low initial accident frequency but this rose at a modest rate with experience. For the oldest group of drivers (31-40 years), 'at fault' accident frequency was at a comparatively low level and the very slight rise with increasing experience was not statistically significant.

The measure of the complete accident history of those aged 21-25 years in terms of average number of accidents per year over the drivers' experience was lowest for those with least driving experience and greatest for those with most experience. This increase was probably influenced in part by the accident rate of the more experienced drivers including an accident history which started in the age group 17-20 when accident frequencies were much higher. It was not possible to take account of this by disaggregating the data further. The curves for the youngest and oldest age groups (curves A and C) may have been similarly influenced, but the effect will be less than that observed for the 21-25 year old age groups.

3.5.7 Effect of other variables

The average frequency rating for driver violations (ACTV) was a highly significant variable and indicated that accident frequency increased for those drivers with higher average reported ratings, the increase being greater than 3 times over the range from rating 1 to 5 (the minimum and maximum values within the data). This average rating over the seven driver violations was used in preference to choosing just one of the driver violation frequency ratings, since most of these measures were highly correlated with each other. Though ACTV was based on self-reported ratings, its strong effect was notable and indicated that those who perceived themselves as making more violations of traffic law were more liable to be involved in an accident.

The average of the observer's six assessment ratings (OASSA) also provided as good a variable as any of the individual ratings. Over the range from 1 to 6.6 within the data, the reduction in 'at fault' accident frequency was over 60%. Thus, drivers who were observed overall to drive better also reported lower 'at fault' accident frequencies.

Drivers who were frequently accompanied by friends as passengers were associated with a higher 'at fault' accident frequency. The range of the variable SHAR5 (the proportion of driving time accompanied by friends) was from 0.0 to 0.9. Over this range, the 'at fault' accident frequency was predicted to more than double. The youngest age group (17-20 years) spent much more of their driving time accompanied by friends (see Section 3.4.3), so were most affected by this influence.

The final variable in the model was the factor CONF13, which indicated that for those drivers who were observed continually to be driving too fast, the 'at fault' accident frequency was higher by some 40%.

3.5.8 Driver UDA models

Neither the UDA (13% of explainable variation) nor dangerous UDA (21%) models were as well fitting as the 'at fault' accident frequency model (92%). Other variables which entered these models but which had not entered the 'at fault' accident frequency model were:

NJP2 = proportion of journeys for shopping purposes
NRAD = proportion of journeys with the radio on
IMP8 = driver's rating of importance of safety in car choice (on scale 1-7)
IMP10 = driver's rating of importance of appearance in car choice (on scale 1-7)
TJP2 = proportion of driving time for shopping purposes
MPW = mileage (in thousands) per week (from driver diary)

Whilst bearing in mind the relatively poor fit of the UDA models, some very tentative, but interesting conclusions (not incorporated in the 'at fault' accident frequency model) might be drawn from the dangerous UDA model.

Higher proportions of journeys made with the radio cassette on (NRAD) were associated with higher dangerous UDA scores. For those who made all their car journeys with the radio on, the associated effect was to more than double the total dangerous UDA score.

Drivers who rated safety as important in car choice (IMP8) were associated with lower total dangerous UDA scores. Over the range from 2 to 7 within the data predicted, total dangerous UDAs were lower by over 60%.

Conversely, drivers who rated appearance as important in car choice (IMP10) were associated with higher dangerous UDA scores. Over the range from 1 to 7 within the data, total dangerous UDAs were more than doubled.

3.5.9 Discussion

The effects of age and experience on driver behaviour were similar to earlier studies which show that accident liability is dependent on driver exposure (total annual mileage), driver age and driving experience (number of years since passing test) (e.g. Maycock, Lockwood and Lester, 1991). Within the age range of the sample, the average number of accidents per year over the drivers' experience was highest for those with least experience and lowest for those with most driving experience. However, these variables were necessarily so confounded that further analysis would have proved unfruitful since it was not possible to determine retrospectively in which year of driving, the drivers had had their reported accidents.

The finding that exposure is related to accident frequency is confirmed by Maycock, Lockwood and Lester (1991). In the current study, total driving years showed a stronger correlation than total mileage to either of the accident frequencies whereas Maycock *et al.* (*op cit*) concluded that total miles driven was a better measure of driving experience than the number of years since passing test. It must be remembered however, that number of years since passing test is easier to obtain from subjects and therefore number of miles driven is likely to be a measure more prone to error. This is only a practical difficulty with the less experienced drivers who, it might be argued, are more likely to be able to give accurate estimates of total miles driven. Experienced drivers who have driven over 50,000 miles in their driving career need only give approximate data since differences in accident liability at this stage of the experience dimension are relatively minor compared to drivers in the less than 10,000 miles stage of their driving career.

Maycock, Lockwood and Lester (1991) found that the difference between men and women drivers who travel similar distances per year was quite small. When mileage effects are corrected for, women should expect to have 35% fewer accidents than men as novice drivers, but only 10% fewer over the age of 30 years. Sex effects should be most marked at the youngest age ranges. The lack of a sex difference in our study may be due to women being more ready to admit accidents and/or these accidents involving a greater number of minor accidents as a result of driver errors rather than more serious accidents amongst the male drivers as a result of driver violations. Unfortunately, such differences (ie degree of severity of accident) were not taken account of in the data that were collected.

Age and experience factors have been identified as variables which show a statistical relationship to the varying levels of accident involvement between driver age and sex groups but are of limited use as explanatory variables within driver age and sex groups.

3.6 Summary

This chapter has identified a number of variables which influence accident probability and as with much earlier work, age, experience and exposure were variables shown to be implicated to accident involvement (for example, Broughton, 1988; Levy, 1990; Maycock, Lockwood and Lester, 1991; Michels and Schneider, 1984; Pelz and Schuman, 1971).

In previous research, 'age' has been regarded as a 'causal' factor, with little attempt to probe further. Such attempts as have been made have tended to emphasise 'internal' aspects, such as lack of skill (possibly through lack of experience), misjudgment of situations, under-estimation of risks, and so on.

However, data from the various components of this study point to alternative means of accounting for much of the variation between the drivers of different age and sex combinations. By contrast to the individual skill/ability level of explanation, attention needs to be paid to the social and interactional aspects of driving, and, in particular, the effects of social contexts. Further, given these contexts, attention is drawn to the crucial issue of choice. In other words, drivers (especially young males) may drive poorly either due to a lack of skill and ability or due to choosing to drive in particular ways, in which social context plays a crucial role. There are two ways in which social contexts can be considered.

The first concerns the immediate social context of driving, and the clear indication that the presence or absence of passengers in the car affects the way people drive. It was demonstrated that higher accident frequency was associated with the proportion of time that young males drove with passengers. From the questionnaire and interview data, it was clear that passengers affected driving in different ways, according to the age and sex of the driver and of the passenger(s). Whereas for the older drivers having passengers in the car tended to lead to safer and more responsible driving than when they were alone, this was not necessarily the case with the young male drivers. The presence of parents led to safer driving, whereas the presence of peer group members led, in many cases, to more dangerous and risky styles of driving.

The second way in which social context appears to have an effect relates to wider considerations than the immediate social context of driving. For example, there was a greater tendency for the young male drivers to select 'speed' and 'acceleration' as important attributes affecting car choice, rather than 'safety' and 'reliability', which were selected more frequently by the older drivers. The results from the questionnaires regarding errors and violations revealed a greater number of the latter amongst the younger drivers. Since, by definition, violations arise from choice, this pattern of results lends strong support to the argument that it is in this area - rather than in purely skill-based assessments - that greater attention needs to be focused.

The distributions of UDA and dangerous UDA scores between the various age groups demonstrated clearly that not all the young male drivers could be regarded as 'unsafe' or 'poor' drivers. Rather, there was a substantial minority who were 'unsafe', and whose scores had the effect of lowering the overall averages for the group as a whole.

Many of the descriptive results presented in this chapter were not readily amenable to statistical testing or did not reach significance. It is argued that some of the apparent variation in driver behaviour evident between the different age groups can be accounted for by the variation within the age groups and that this is particularly pronounced in the younger male driver groups. Indeed, as Ingham (1986) pointed out in many such studies, *'even when variations between groups are found, extreme caution needs to be exercised before interpreting the results and implying causality'* (p.267). As a result of this, a qualitative, intra-group 'follow up' study of the younger male drivers was judged to be worthwhile.

Two general lines follow from this interpretation. Firstly, more needs to be known about the particular distinguishing features of the sub-groups within the young male group; deeper exploration of the features of the 'social worlds' is warranted. Secondly, there are implications concerning training and rectification. A clear lack of skills implies greater skill training is needed. However, given the importance of elements of choice and the social considerations, greater attention needs to be paid to these aspects of driving, and how attempts can be made to counteract the clearly negative impact they can have on some drivers. These considerations are discussed in the following chapters.

4. PERSPECTIVES OF YOUNGER DRIVERS (Study II)

4.1 Introduction

One of the problems identified in Study I was the amount of variation within each of the driver groups. This was particularly noticeable in the younger driver age groups where the range of observed performance measures and self-reported accident histories made it clear that not all young drivers could be treated as one homogeneous group.

It became evident that much research in the young driver field views young drivers en masse as 'unsafe', whereas it may be more correct to identify a sub-set of drivers within this group as 'unsafe' drivers. Not <u>all</u> young drivers are 'unsafe' drivers or have accidents or share the same influential characteristics.

The constant emphasis in studies examining the young driver phenomena on the use of traditional variables such as age, driving exposure and experience speciously suggests a young driver problem since these measured characteristics all the young drivers do share. Ubiquitous results such as these have limited practical application and do little to further our knowledge of driving behaviour. In fact, the constant preoccupation with such variables implicitly suggests a young driver problem and may inadvertently direct attention away from other (potentially) important variables concerned with accident involvement.

It was as a result of the general limitations of such work that Study II was devised to explore a number of variables which might explain intra-group differences in the young male driver group. It was decided that a qualitative approach, fairly novel in driver behaviour research, would be adopted and that the young drivers in the study would be encouraged to become 'active' participants in the research process.

Only young male drivers were selected for Study II since the over-involvement in accidents is demonstrably a greater problem for young males than young females, who have half the mileage-adjusted accident rate of young males (Foldvary, 1979; Broughton, 1988).

4.2 Design

Study II was, in essence, a follow-up study designed to explore, in greater detail, the perceptions of, and social influences on, young male drivers. Two sub-groups of drivers identified from the route surveys in Study I, as 'unsafe' or 'safe' drivers were selected (Section 3.2). Study II gave the drivers an opportunity to forward their own descriptions, assessments and interpretations of their driving in addition to providing their own explanations, motives and influences for such driving behaviour.

An intensive research method using semi-structured interviews was adopted. This technique is not used very frequently in driver research since it is costly, difficult to conduct and time consuming. Intensive research is normally only used, as in this case, when there are a relatively small number of respondents and the information required is of a qualitative nature. Interviewers need to be careful to ask questions in such a way as to obtain answers which are free from bias (see also Section 1.8.2).

It must be noted that this follow up study took place up to two years later than the start of Study I and therefore some of the drivers might have altered or changed their attitudes and behaviour in the intervening period. As the accident statistics emphasise, driving behaviour tends to change over time. Thus, in a small number of instances, drivers who had been classified 'unsafe' in the original study stated that they were now much 'safer' drivers. In such cases their explanations for the changes in attitude and/or behaviour were explored.

4.3 Sample selection and characteristics

Two sub-groups of the younger male drivers from the previous research, one classified as 'unsafe' and one as 'safe' were selected. The two driver groups comprised those drivers who had previously scored the lowest and highest ratings on the overall safety ratings based on their assessed driving performance on the 40km route survey. The 'unsafe' driver group were those drivers who had scored one or two on the seven point safety scale, with the 'safe' group being those drivers who scored 5 or more on the same scale (see Section 2.2.2.5). Initially, the youngest drivers were contacted (17-20 years) but some drivers in the older age range (21-25 years) were included in order to reach the required sample numbers.

The 75 drivers from the original study who fell into either of the two groups were then contacted concerning their willingness to take part. 56 drivers agreed to take part, with 29 from the 'unsafe' driver group and 27 from the 'safe' driver group. Drivers were paid a small amount (£10) as an incentive to take part.

All the 'background' factual data in Study II were provided by the drivers at the time of the earlier study. The age distribution of the drivers is shown in Figure 4.1.

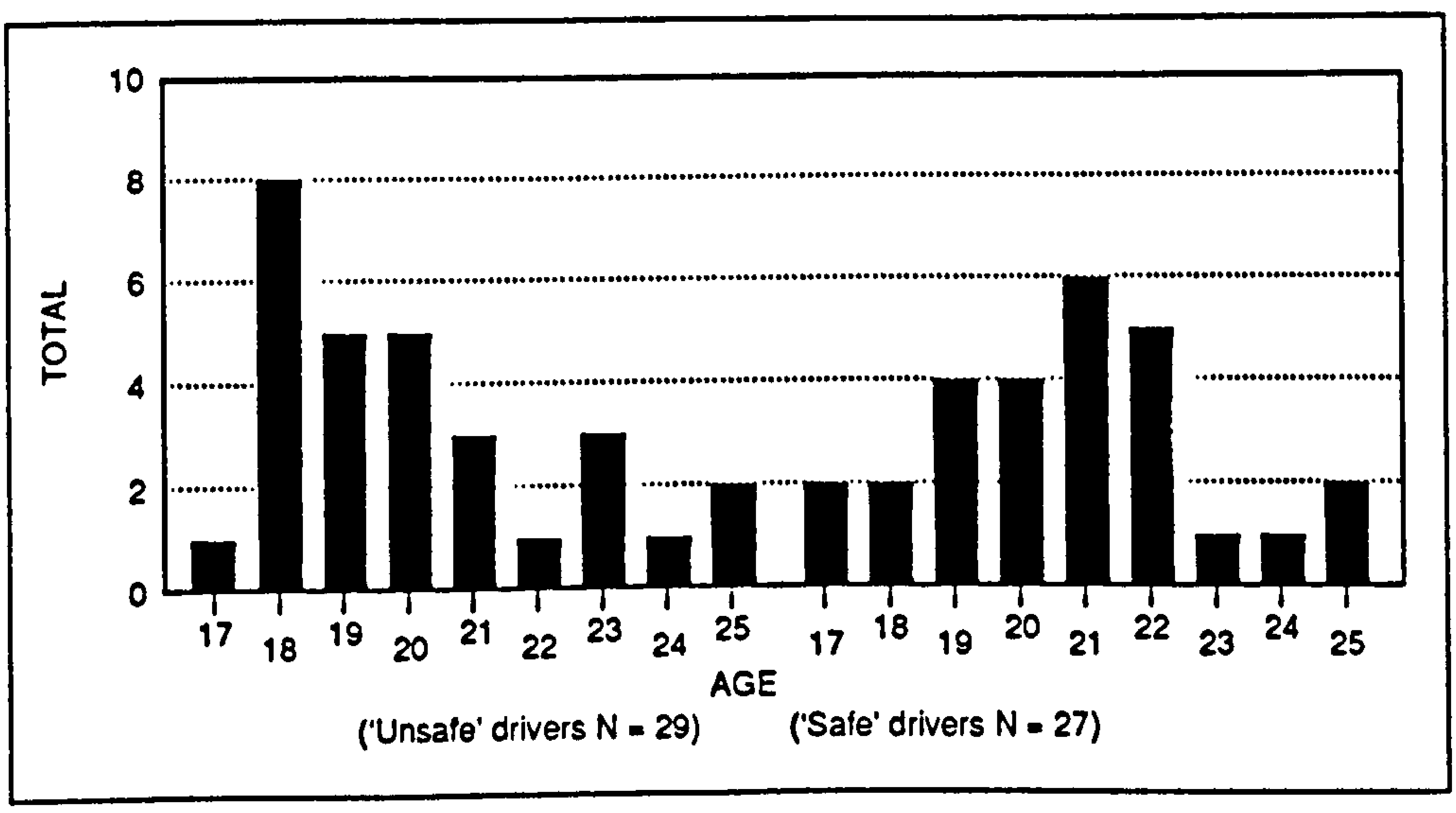


Figure 4.1: Age distribution of the drivers

A breakdown by socio-economic grouping (S.E.G.) of the driver is given (Table 4.1). All of the drivers were single with the exception of three 'safe' drivers who were married. None of the drivers had any children.

Table 4.1: Socio-economic grouping (%) of the sample

Socio-economic grouping (*)	'Unsafe' drivers	'Safe' drivers
Non-manual (1-3)	34	19
Manual (4-6)	21	33
Students (7)	45	44
Unemployed (10)	-	4
Total	100	100

(numbers rounded to nearest percentage)

* The numbers in brackets refer to the Registrar General's classification from 1-10 used for the General Household Survey. S.E.G.(8) = Housekeeper, of which there were none. S.E.G.(9) = Retired, of which there were none.

There were no statistically significant differences between the average age, average miles per year and average career miles of the 'unsafe' and 'safe' driver groups (Table 4.2). The 'safe' group of drivers had, on average, been driving slightly longer than the 'unsafe' drivers (about 6 months).

Table 4.2: Driver age, miles per year and career miles (averages)

	'Unsafe' drivers	'Safe' drivers
Age (years)	20.14	20.70 *
Miles per year	11,724	10,126 **
Career miles	24,330	28,288 ***

* $t = -0.95$, df.54, $p > 0.05$

** $t = 0.76$, df.54, $p > 0.05$

*** $t = -0.81$, df.54, $p > 0.05$

In terms of education, more of the 'safe' drivers had left school at 16 years of age (41% of 'safe' compared to 28% of 'unsafe' drivers), with more of the 'unsafe' drivers going on to further study beyond 18 years (51% of 'unsafe' drivers compared to 37% of 'safe' drivers).

4.4 Interview content and procedure

Interviews lasted between one to two hours covering a number of topics including driving behaviour and practices, assessment of risk, driving history, attitudes to other drivers, lifestyle, leisure activities, peer group influences, explanations for their driving behaviour and their attitudes to cars and driving (see Appendix A.10).

All interviews were conducted by the same researcher to ensure consistency. Prior to the interview, the researcher did not know whether the driver had previously been assessed as an 'unsafe' or 'safe' driver (although in many cases this became somewhat apparent during the course of the interview!). As far as possible, the interviewer followed the same topics for all subjects, whilst, at the same time, allowing the subject to talk about other important areas that developed. A number of set questions were asked of all the drivers who had to rate the degree or extent of their answer on visual analogue rating scales which were provided. These questions were primarily used to initiate different topics and provided a useful tool for the interviewer to see immediately where the driver rated his behaviour or views on various topics and probe accordingly. It is recognised that a major problem with the use of such scales is that different people start from a different base level of assessment. For example, what one driver assesses as 'safe' driving another may assess as 'risky'. Due to these interpretive difficulties, it was the explanations and descriptions of behaviour that formed the basis for their ratings, rather than the ratings themselves, that were of paramount interest.

The interview was semi-structured and as informal and friendly as possible to help the subject to relax and give 'honest' answers. Specific evidence drawn from their own experiences was encouraged since it was felt this was likely to be more accurate than any sweeping generalisations that might be presented. All interviews were tape recorded for subsequent transcription and the majority took place at the respondents' homes.

4.5 The relationship between the two studies

Study II was a development from, and enhancement of, Study I in that it sought to investigate in more detail, a number of factors which might help to explain the differences evident in driver behaviour and performance within the younger male groups (17-25 year olds).

Study I had identified intra-group differences, Study II sought to explore them.

4.6 Previous information on the 'safe' and 'unsafe' drivers

The aim of Study I was to identify those aspects of driver performance, attitudes and behaviour that related to accident involvement of different driver age groups (17-25 years and 31-40 years) with differing levels of driving experience.

Although the 'unsafe' and 'safe' driver groups were selected for Study II on the basis of the overall rating by the observer at the end of the route survey, the number of UDAs (Unsafe Driver Actions) and dangerous UDAs made during the route surveys by these two driver groups also showed considerable differences. The 'unsafe' drivers committed over twice as many UDAs and dangerous UDAs as the 'safe' drivers on the 40km route. A similar pattern was evident with the reported numbers of accidents per year of driving and the numbers of 'own fault' accidents per year of driving (Table 4.3). These results confirmed that the criteria chosen to select the 'unsafe' and 'safe' drivers groups were adequate.

Table 4.3: Driver performance and accident history (averages)

	'Unsafe' drivers	'Safe' drivers
UDAs	107	52*
Dangerous UDAs	15	6**
Number of accidents per year	0.64	0.30***
Number of 'own fault' accidents per year	0.54	0.12****

* $t = 4.98$, df.54, $p<0.01$
** $t = 0.14$, df.54, $p>0.05$
*** $t = 2.35$, df.54, $p<0.05$
**** $t = 3.50$, df.54, $p<0.01$

Information obtained from the questionnaires on driver behaviour patterns showed little differences between the 'safe' and 'unsafe' male driver groups over the purpose for which they use their car, but some differences concerning passenger presence on journeys. The 'unsafe' driver group spent less time driving on their own and also less time with a partner/spouse only but spent more time driving with friends in the car than the 'safe' driver group (Table 4.4).

Table 4.4 Passenger occupancy (% of driving time)

	'Unsafe' drivers	'Safe' drivers
Alone	59	65
Partner/spouse	3	10
Friends	32	24
Other combinations	6	1
Total (%)	100	100

Car ownership details were slightly different between the groups in that more of the 'safe' drivers owned their own car than the 'unsafe' drivers. More 'unsafe' drivers borrowed their parents' car or had a company car than the 'safe' drivers (Table 4.5).

Table 4.5: Car ownership (%)

	'Unsafe' drivers	'Safe' drivers
Own car	62	82
Employer	14	7
Parents	21	11
Other	3	0
Total (%)	100	100

The average age of car driven was older for the 'unsafe' drivers (average = 10 years old) compared to the 'safe' drivers (average = 8 years). The engine sizes were very similar (1400cc) with five of the 'safe' drivers and two of the 'unsafe' drivers driving a GTi/Turbo car.

Almost a quarter (24%) of the 'unsafe' drivers drove illegally prior to obtaining their provisional licence compared to just over one sixth (15%) of the 'safe' drivers. The average number of lessons ('unsafe' drivers = 17; 'safe' drivers = 15) and average number of tests ('unsafe' drivers = 1.57; 'safe' drivers = 1.50) it took for each group of drivers to obtain their full driving licence were not significantly different.

In terms of car choice, both driver groups rated safe and 'practical' qualities of cars (reliability, safety and utility) as more important when buying a car than 'expressive' qualities (speed, acceleration, appearance and engine size). However, the 'unsafe' drivers rated safe and practical qualities of cars less important than did the 'safe' drivers and rated 'expressive' factors as more important than did the 'safe' drivers (Table 4.6).

Table 4.6: Rating of importance of car qualities

	'Unsafe' drivers	'Safe' drivers
Practical qualities	5.30	5.63
Expressive qualities	4.85	4.45

(Average rating score with 1 = Not at all...7 = Extremely)

It can be seen that some differences emerged between the young driver groups when further classified into so-called 'safe' and 'unsafe' driver groups. However, the main purpose of Study II was to look beyond these so-called 'hard', external facts to explain behaviour by giving the drivers themselves an opportunity to describe and explain their own behaviour.

Having briefly considered some of the information previously obtained from the samples, we now turn to consideration of the drivers' perceptions and attributions. The following chapters cover aspects of lifestyle, self assessments of driving, attitudes and reported social influences.

5 DRIVER REALITY AND DRIVER PERCEPTION

5.1 Introduction

Young drivers (less than 25 years) have higher casualty rates than older drivers (more than 25 years) (Department of Transport, 1991). The manner in which these young people drive seems to account for this over-representation in the accident statistics. In other words, in general, young drivers probably take more risks than older drivers. In addition, there are some young drivers who take greater risks than other young drivers. Why is this? It is possible that this greater level of risk-taking is due to a lower level of perceived risk; a greater willingness to take risks, or a greater belief in their driving ability to avoid accidents. Acceptance or misperception of risk and misperception of driver ability would, therefore, appear to be important concepts in traffic research.

The present chapter examines the relationship between perceived risk (likelihood of having an accident and levels of safety) and driving ability amongst young male drivers. Examination of the possible contribution of each of these factors to accident involvement is essential since these different explanations require different countermeasures.

5.1.1 Perceived driver ability and risk

In common with problems of terminology identified earlier, there would appear to be no general agreement on a technical definition of the term 'risk'. However, taking the definition of risk adopted by Brown and Groeger (1988) that risk is *'the ratio between some measure of adverse consequences of events and some measure of exposure to conditions under which those consequences are possible'* (p.586), it will be evident that, in practice, risk is a quantity (except in trivial cases) that has to be estimated rather than deduced. In the traffic domain, this is because no method for recording accident incidents, and more particularly exposure data, will ever be entirely accurate (see also Section 1.9).

The main theories of risk (Fuller, 1984; Naatanen and Summala, 1975; Wilde, 1982a, b) are, in essence, perceived risk models. These models deal mainly with cognitive and conscious levels of risk perception and it would seem that the young driver is only partly aware of these aspects of their vulnerability. Perception of 'objective risk' in a situation, and perception of 'subjective risk' to oneself, in that situation, should be a straightforward relationship, but it has been shown how difficult it is for an individual to assimilate the one with the other. In short, the management of risk by an individual assumes a complex implementation of cognitive and affective skills which differ according to the extent of the risk under consideration. The relationship between 'objective' and 'subjective' risk will vary between driver, type of journey, time available for journey and numerous other factors. It can be seen that the risk picture becomes extremely complex and these theories do not help to explain why risk is accepted and so it may be that other ways of tackling the problem of risky driving behaviour will prove to be more fruitful.

Inadequate driver risk perception can result from three different causes, or some combination of the following: (a) people can over-estimate their own driving ability to cope with risk, (b) they can make a conscious decision to accept a particular level of risk or (c) they may be deficient in their perception of risk. Questionnaire studies on risk perception and behaviour are difficult to interpret because each individual has his/her own interpretation of what constitutes 'risky' behaviour. It is thus difficult to measure the influence of risk on different road user populations. For example, if it is accepted that non-perceived risk is greater in childhood than adolescence, then adolescents have a higher perceived risk, and yet the risk taken during adolescence is higher than during childhood (Assailly, 1991). However, it might be argued that this situation occurs because the opportunity to experience risk is greater in adolescence. Nevertheless, with this interpretation, the crucial factor is the significance of risk to an individual.

Younger drivers have a particularly high risk of being involved in a casualty accident even when the quantity and quality of their exposure to such risk is controlled (Broughton, 1988). It might be expected that younger drivers are more likely to misperceive and misjudge traffic situations due to their limited traffic experience, although Laberge-Nadeau *et al.* (1992) suggest comparatively low driving experience (less than 0.5 years) is a 'safer' period than higher driving experience (greater than 1.5 years, but less than 2.5 years). Zuckerman (1979) outlined the way that younger people are more likely to take risk as part of the reported connection between youthfulness and sensation seeking and it is easy to see how this could be appropriate to car driving behaviour. Jessor (1987) argued that risky driving was just one part of a larger *'developmental behavioural health syndrome'* (see Section 6.1.1).

Finn and Bragg (1986) suggested that young drivers have higher accident rates because they are either more willing than older drivers to take risks or fail to see hazardous situations as dangerous, or a combination of these two factors. Appropriate countermeasures would vary dependent on whether young drivers choose to take higher risks or simply do not recognise their actions as risky. Results showed that young drivers recognised that their age group is more likely to be involved in an accident than older male drivers, but that they perceived their own risk to be significantly lower than their peers. Older drivers estimated their own chances of being involved in an accident as comparable to those of their peers.

Anderson (1978) provided evidence that factually based traffic materials did not reduce drivers' accident involvement levels within the six months after study. It is possible that this is because such materials are inevitably based on past risks and people may feel that these have little bearing on present and future events. It is argued that many of the measures of 'objective risk' are often at variance with the real risks experienced by road users. There is also the possibility that informing drivers of the statistical accident risks or overall number of accidents may confirm a belief that accidents happen to other people and not to themselves. There is some debate as to whether people find it too difficult to estimate the frequency of low probability events, although Cousins (1980) indicated that subjects can make worthwhile and meaningful estimates of that kind.

One problem with driver risk assessment is that accidents do occur at very low levels of risk. Indeed, it is possible for a driver to eliminate as much risk as possible from the driving situation by driving safely and carefully at selected times of day on selected routes and still not save themselves from being involved in a fatal accident. The realisation of the possibility of having an accident mainly as a result of chance or bad luck might have some effect on subsequent driving behaviour. This topic will be investigated, as will the possibility that young drivers underestimate the risks of having an accident.

It is important to note that risk assessment is just one factor affecting driving style. Additional factors examined include passengers, driving image, attitudes to cars and so forth. It must be noted, as Haight (1986) stated, that *'conscious evaluation of risk is normally a quite insignificant factor, particularly when we bear in mind that the risk (either as probability or as expectation) is itself normally extremely small'* (p.363). The idea that there may be some social factors that determine assessment of risk - a sort of 'social assessment' of risk - needs to be explored.

A commonly claimed notion in psychology is that people need high self-esteem (Dittes, 1959) and that people's self-concepts play a major role in their behaviour. A possible implication of this is that this need may lead a person to have an inflated view of his/her own ability at any number of tasks. Gergen (1971) emphasised this by stating *'to feel esteem for self is akin to one's most basic experience of well-being'* (p.69). In order for this over-estimation of ability to occur, the self-esteem need must be aroused in a situation in which over-estimation of ability is possible and where the ability in question is valued enough in order to produce the effect of self-esteem. It is suggested that car driving is one such activity in that driving ability and/or safety are likely to be valued abilities by many drivers. In addition, unlike many other skilled activities, there are few 'objective' criteria to measure driver performance.

Misperception of driver ability or unrealistic skill evaluation may also be an important factor in accident involvement. Believing oneself to be a more skillful and safer driver than others may lead to risk-taking beyond the capabilities of the individual driver. Furthermore, such risk-taking, if it does not result in any accidents or near accidents over a period of time, may be reinforced by the individual drawing on such experiences as evidence of their (mistaken) perception of their own driving abilities.

It has long been held that drivers tend to believe themselves to be better drivers than the average driver. Drivers in such studies have most commonly been asked to judge their driving ability, safety levels and so on, in comparison to the average driver (defined in terms of the general driving population) and results have shown that the majority of people (70% to 80%) assess themselves to be in the safer half of the distribution (Naatanen and Summala, 1975). One of the criticisms of such studies is that subjects lack information about other 'average' drivers and so comparisons should, more correctly, be made with similar groups of drivers. This prevents the possibility that group stereotypes may explain results (e.g. 'older drivers are the best'). However, where such controls are introduced, 'over-estimation' findings still emerge (McCormick, Walkey and Green, 1986; Svenson, 1981), with younger drivers more confident of their abilities than older drivers (Matthews and Moran, 1986). These results are often explained by subjects having a low memory availability for negative events (ie 'near misses') (Tversky and Kahneman, 1973) or due to not taking account of driving experience levels (Groeger and Brown, 1989). This optimistic view of driving ability may lead to greater risk taking than is wise amongst all driver groups, but particularly the younger driver groups. However, Schuman *et al.* (1981) report that 'young' drivers over 21 years were at risk of having the most serious accidents due to a combination of over-confidence in their ability allied to their increasing driving exposure levels.

Weinstein (1980) found that generally, people have an above average optimistic bias about positive future life events and below average for future negative events.

However, the negative event of 'being injured in an auto accident' was one of the few events not found to be consistent with this hypothesis. The explanation given for this finding was that the optimistic bias is not so pronounced when an event is perceived to be beyond the control of an individual (see McKenna, 1991, for discussion on 'illusion of control'). This finding was repeated by DeJoy (1989) in a purely traffic based study who reported that perceived controllability of specific accident events (with differing possible levels of controllability) was a strong predictor of optimism.

Other studies (Preston and Harris, 1965; Slovic *et al.*, 1978) have provided evidence of the greater generality of findings concerned with over-estimation of abilities. Past research confirms that people accept more responsibility for a success than for a failure (Luginbuhl, Crowe and Kahan, 1975). Some authors (Storms, 1973; Taylor and Fiske, 1975) have argued that this egocentric bias is due to the fact that individuals locate the cause of their failed behaviour in the environment whereas the same behaviour in others is attributed to traits possessed by the individual. It is suggested that this 'actor-observer' effect occurs because an individual cannot see their own behaviour and thus gives greater weight to environmental factors in explaining their behaviour. In contrast, when viewing the behaviour of another individual, attention is drawn to the actual behaviour and thus the individual is seen as more of a causal agent than may be the case (Taylor and Fiske, *op cit*). McKenna, Stanier and Lewis (1991) showed that drivers tend to have a 'positive self' view of their driving across all twenty of the driving measures that they examined rather than a 'negative view' of others. One hypothesis called the 'superior conformity of the self' behaviour that might help to explain why people over-estimate their abilities at particular tasks will be briefly presented.

5.1.2 'Superior conformity of the self' behaviour

In comparison processes between the self and others within a defined social set or group, it has been observed that a significant majority of people present themselves as more in conformity with the social norms or rules prevailing in the set or group to which they belong than others in that set or group generally are (see also Section 6.1.2). The comparison between the individual and the group to which they are a part takes place among equals and thus does not involve hierarchic systems within the group. This type of behaviour has been labelled 'superior conformity of the self' behaviour (Codol, 1975).

The group of people which the individual compares him/herself with has a given number of traits or characteristics which they all share (the terms 'trait' or 'characteristic' should be understood in the broadest sense meaning the way one can, in any way, qualify the object under discussion). The groups may, depending on their common characteristic, either represent the outcome of a purely cognitive categorisation process (for example, the group of persons who are car drivers aged 17-25 years) or they may represent a concrete material reality (for example, the group of 17-25 year old drivers that actually took part in this study).

Each group that a person feels he/she belongs to is characterised by a given number of traits or characteristics which the individuals belonging to the group possess. All of the individuals in the group follow to a greater or lesser extent the social norms or rules that prevail in any situation which they might find themselves (for example, in a pub or in a car). The manner in which an individual compares him/herself to others is thus dependent on the social norms or rules that are evident or prevailing in the group to which they feel they belong. The greater the degree of strength of these norms, the more likely people are to state that they more closely follow the norms of their group.

An explanation for the phenomenon of the 'superior conformity of the self' behaviour is that this behaviour is based on the existence of a conflict between two simultaneous processes that are complementary and yet also, at the same time, contradictory. These are; that an individual has a need on the one hand for social conformity and, on the other, a need to avoid de-individualisation of themself and their behaviour. In order to overcome this feeling of de-individualisation, which is often viewed as a negative attribute for an individual (even by definition!), the person searches for social differentiation and individualisation within the group. Thus, there is the contradiction. In order to realise oneself as an individual, the person conforms in a superior way, that is, conforms more, or to a larger extent, with the norms than others in their group. Such a process results in the phenomenon of the 'superior conformity of the self' (Codol, 1975).

There have been many studies that have provided evidence to support this hypothesis. Codol (1975) attempted to induce in three subjects, acting as a group, either a co-operative or competitive tendency toward the others for the task that they were given. At the end of the task, all subjects were given a questionnaire concerning their involvement and behaviour during the task. In all of the experiments, if 'co-operation' was perceived as the operating norm, each person had a noticeable tendency to consider themselves more co-operative than their fellow subjects within the task. However, in groups where 'competition' was perceived as the operating norm, each person tended to rate themselves as more competitive than their companions. Similar results were found when 'creativeness' or when 'being methodical' were perceived as being the operating norms.

Another experiment (Codol, 1975) which set out to examine the ability of people at the performance of a particular task produced some interesting results. The task involved four subjects, three of whom were confederates of the experimenter, estimating the lengths of a number of wooden rods. Each subject gave three oral estimations, one at a time, in turn. One of these confederates consistently gave precise estimates of the twelve rod lengths which inevitably turned out to be more accurate estimates than those of the naive subjects. Results showed that there was not only a systematic over-estimation of the naive subjects' own performance and ability at correctly estimating the measurement of the rod lengths, but also a tendency to attribute themselves the best performer of the group. Indeed, as the naive subjects adapted to the task, they believed that their estimates became more and more accurate and thus in their own view, correct estimation became more and more normative for the situation. As this developed the subjects increasingly assessed themselves as the best performers in the group. This percentage rose from 28.7% for trials numbered 1-3 up to 50% of the total for trials numbered 10-12 (Codol, 1975) Thus, it is evident that if ability at a given task is considered to be an important attribute within a group behaviour, then individuals may assess themselves to be superior to other group members in this respect.

It may be the case that this hypothesis involving the 'superior conformity of the self' behaviour can be applied to car driving behaviour. Evidence from the route surveys suggests that drivers assess themselves as better drivers (dependent on their own definition of 'better') across a number of measures than do expert driving observers. It might also be hypothesised that drivers perceive themselves as belonging to a particular subset category of driver (based on any characteristic ranging from age to car type) and that within that group they assess themselves as superior drivers based on whichever norms are salient operators for the group.

Drivers may consciously adapt their driving depending on the group to which they feel they belong. For example, driving a sports car may make someone feel they are expected to drive in a particular style. Moreover, having particular groups of passengers in the car may make differing demand norms on the drivers who may alter their driving to the perceived situation.

Many of these issues will be explored within the young male driver group.

5.2 Perceived ability

Earlier studies have shown that drivers tend to over-estimate their driving ability (McCormick, Walkey and Green, 1986; Svenson, 1981). It has been suggested that over-estimation of ability may be a determining factor in accident involvement. Therefore, drivers in the present study were asked to rate their driving performance in terms of both driver skills (handling and car control) and driver safety compared to (a) male drivers their own age and (b) more experienced drivers (30-40 years).

As a whole, the young male drivers rated their driving skills and driving safety considerably above an average driver their own age. However, overall, the same drivers rated their skills and safety only just above an 'average', more experienced driver (30 years and above). This finding suggests that the young drivers recognise that more experienced, older drivers are more highly skilled and safer drivers than young males (17-25 years) in general, but that this does not apply to their own driving performance, which they rated as far better than their peer group and a little better than older, more experienced drivers.

Generally, the 'unsafe' drivers rated their driving skills (handling, car control) slightly higher than the 'safe' drivers. 'Unsafe' drivers, although still rating their safety level considerably above that of the average driver, rated their safety level below the level rated by the 'safe' drivers. 'Unsafe' drivers rated their driving as slightly more skilled than safe, whereas 'safe' drivers rated their driving as slightly more safe than skilled. There would appear to be a number of explanations for this.

Many of the 'unsafe' drivers believed their driving was highly skilled (and it may indeed be so) because they 'test' their abilities and car capacities either on or off-road to a much greater degree than do the 'safe' drivers. If such a hypothesis is correct, it provides further evidence that driving skill (car control and handling) is not of overriding importance to accident avoidance (since this group had higher accident involvement).

It must be noted that the data has not been quantified in any detailed way. It was felt that quantifying the data might result in 'pigeonholing' the different views of the drivers and thus missing the full 'richness' of the data. The use of the terms 'majority' and 'typical' can be clarified however. The majority refers to approximately 65% of the drivers in the appropriate group and the term 'typical' means that the quotes presented are broadly representative of the majority of the particular group (see also Section 8.2).

Some typical comments by the 'unsafe' drivers were:

#2: They (friends) probably don't test the cars out so much, so I think I could go faster and keep control better. (Unsafe driver, 18 years (age at time of Study I))

#5: I had a fast car once, so I learnt to drive. The first time I really had to open her up and see how fast it would go, I did 120, that's all it says on the clock, it used to sit there on 120 so if we were doing more I don't know... I used to like it when it was wet when I had my old car because I would mess around making it slide everywhere. There is a sharp corner on the way to work and every car I've had I have seen how fast I can go round without coming off the corner. (Unsafe driver, 18 years)

#15: I'd say it's a lot better, there's a lot of people who will drive as fast as me but they might be going faster than they can safely do so, the lines they take on corners, I've been up at Brands Hatch and it was very beneficial. (Unsafe driver, 20 years)

#17: Somewhat better, I drive the car nearer to the limits than other people and I know where the limits are. I can cope with situations, reflexes are a little bit finer tuned. I rolled my parent's car trying to see what the car would do and it wouldn't quite do it. (Unsafe driver, 20 years)

#24: Perhaps driving quite fast on a quiet road to see how the car will cope... (Unsafe driver, 24 years)

Whereas, typical comments by the 'safe' drivers were:

#43: Once I did, when it was snowing and even if I had spun I could have stopped in the 400 yards before I hit anything. (Safe driver, 21 years)

#51: I tried a handbrake turn in a field, just once with a mate, to see what happened; never on-road. (Safe driver, 23 years)

It is obviously extremely difficult to judge one's driving performance *per se* or in relation to other drivers. There are relatively few objective criteria for measuring driver ability. As one driver commented: *#30: I suppose everyone says quite good, it's difficult to know because I've never sat in the passenger seat (Safe driver, 17 years).* Accident involvement might suffice as a measure, but accidents are actually fairly rare events and it is often easy to blame external circumstances rather than one's own mistakes for any accident occurrence. This would appear to be an important point. As it is often presented in lay terms, no (male) driver wants to be thought of as a bad driver. This certainly appeared to be the case with the vast majority of the young male drivers interviewed.

The lack of an adequate way of assessing driving behaviour once the Department of Transport test is passed ensures everybody can claim to be a 'good' driver with little fear of being proved wrong. One driver stated *#52: I think I'm a bit safer than most to be honest, I don't like being not good at anything (Safe driver, 24 years)*. However, earlier in the conversation this driver had admitted to being awful at cricket and so he was reminded of this and he replied: *#52: Oh well, something like that, you can define your competence in it, it's not the same with driving*. Driving is a behaviour usually regarded as a highly useful and important skill which is performed on a regular basis. It may be that because of this and due to the lack of objective assessment of driving ability the vast majority of drivers feel it is important to be 'good' at this activity. The very small number of drivers who stated they did not think they were particularly 'good' drivers almost seemed to be embarrassed by this disclosure.

One possible way of assessing driver ability is to take additional driving courses or extra tuition. Drivers were asked if they had participated in any such courses. A larger percentage of the 'safe' drivers (37%) than the 'unsafe' drivers (14%) were either advanced drivers (IAM or RoSPA members) or had taken courses run by the local police forces. Therefore, the 'safe' drivers might have had a firmer 'objective' basis for assessing their driving as better than the 'average' driver. It is not possible to conclude that the courses that the 'safe' drivers completed, helped them subsequently to be categorised as 'safe' drivers, since it may be that those 'safe' drivers are the ones most likely to actively seek out 'safer driving' courses. One police officer who runs safer driving courses confided that it sometimes appeared that *'they were preaching to the converted'*.

A major difference between the 'safe' and 'unsafe' drivers emerged when the drivers were asked how they would define a 'good' driver. 'Safe' drivers generally took this to be a driver who was safe, considerate and courteous and did not get in the way of other drivers. However, 'unsafe' drivers tended to define a 'good' driver as one who could handle the car well, was positive in their actions, had quick reactions and so forth. It would appear that, in general, the 'safe' and 'unsafe' drivers emphasised different qualities of drivers similar to the way that they looked for different qualities of cars when it came to car choice (Section 4.2).

'Unsafe' drivers more frequently defined a 'good' driver as:
#2: Someone who doesn't panic in a situation, is alert, can drive fast on a bendy road without holding up traffic. (Unsafe driver, 18 years)
#4: Someone who can control a car, any car and control it well. In an emergency, can stop suddenly, corner suddenly...someone who's confident, knows what spaces they can get through and knows how to reverse it just as well as they know how to drive it forwards. (Unsafe driver, 18 years)
#10: Quick reactions, good anticipation, I reckon... (Unsafe driver, 20 years)
#15: ...the ability to read the road and know the performance and handling of the car, you've got to know the limitations... (Unsafe driver, 20 years)

'Safe' drivers, however, more commonly defined a 'good' driver as:
#31: Anyone who gets from A to B without endangering himself or anyone else on the road... (Safe driver, 18 years)
#39: A good driver is one who goes from A to B and no-one's noticed he's been on the road. (Safe driver, 20 years)
#41: Someone who's completely aware of what's going on around him and acts accordingly and has consideration for others... (Safe driver, 18 years)
#42: One who drives in a way that doesn't affect anyone around him, he drives safely of course; mainly to think of others rather than yourself. (Safe driver, 21 years)

NB: It is unclear whether subjects who referred to drivers as male were deliberately doing so because they felt that 'good' drivers were usually male or whether they always refer to a third person as male.

It was evident that, in general, both groups of drivers felt that they were 'good' drivers, but that the 'safe' and 'unsafe' drivers differed in their interpretation and definition of a 'good' driver. These two findings may be related. It is arguable, since all the drivers felt they were better drivers than average, that when they were asked to define a 'good' driver, the drivers defined and described their own driving. Thus, the 'safe' drivers put the emphasis on good driving as safety related, whereas the 'unsafe' drivers put the emphasis on driving skill. One way of exploring this was to examine the drivers' rating of their own risk-taking behaviour whilst driving. For example, did the 'unsafe' drivers choose not to emphasise the importance of safety for good driving because they were aware that they took considerable risks whilst driving and therefore, using that criterion for a definition of a 'good' driver, they would have had to have rated themselves as 'poor' drivers?

5.3 Perceived risk

Drivers were asked to assess their own level of risk-taking compared to (a) other male drivers their own age and (b) older, more experienced drivers (30-40 years).

'Unsafe' drivers rated their driving equally as risky as an average driver of the same age but more risky than an average driver in the 30-40 year old age group. 'Safe' drivers rated their driving less risky than an average driver the same age and as risky as a 30-40 year old driver.

The 'unsafe' drivers rated their driving considerably more risky than the 'safe' drivers assessed theirs to be. It was impossible to compare 'safe' and 'unsafe' driver ratings since what was assessed as 'risky' for one driver may have been assessed as 'safe' by another driver. As one driver, whose route survey was, in the earlier study, terminated on safety grounds, commented: *#17: I've got my own idea of what's safe and I tend to drive at that (Unsafe driver, 20 years).* Another 'unsafe' driver who had four convictions for various driving offences (including excessive reversing for over 5 miles!) claimed: *#22: I'm quite a bit safer than* *most. I haven't had any accidents, well I've had two, but most people I know seem to be doing things like driving into the back of lorries (Unsafe driver, 20 years).*

Different interpretations of behaviour were inevitable. Therefore, drivers were asked what type of risky manoeuvres they performed. Differences between the two driver groups emerged with the 'unsafe' drivers listing a greater variety of risky manoeuvres. The 'safe' drivers also admitted performing risky manoeuvres but they were generally less extreme in their undertaking than the 'unsafe' drivers. 'Safe' drivers' risky manoeuvres were most commonly speeding over the limit, just *'going with the flow of the traffic' (#32).* In addition, the 'safe' drivers tended to perform them on a less frequent basis than the 'unsafe' drivers. Some of the actions described as risky by the 'safe' driver group, such as exceeding the speed limits by small amounts, might not have been categorised as risky by the 'unsafe' drivers. Speeding was a behaviour performed by almost all drivers. It was noticeable that most of the risky driving behaviour was intentional and violational in nature.

Some of the 'unsafe' drivers commented:

#2: ...I've gone the wrong way round roundabouts to get to exits...I see my mate drive his car half on the road and half on the kerb... there's a jump on the road that if you go fast enough you take off, we'd go up there and try to take off. It's a talking point. If we're going from one person's house to another, we'll just keep trying to overtake, nearly every time we'd do that. (Unsafe driver, 18 years)

#4: I do power turns, I spin it and bring on the opposite lock, bring the power on and power out of it. (Unsafe driver, 18 years)

#5: In the VW Golf, in Cornwall, me and my girlfriend and two mates, we were driving along a road about 110 mile/h, just overtaking and we came to a bridge and I didn't know what was going to be on the other side and we just carried on over it - that was pretty risky... (Unsafe driver, 18 years)

#21: I never do 30 mile/h in a 30 limit because that's like walking pace, ain't it? (Unsafe driver, 21 years)

#22: I'll overtake when I can see I've got 6 inches to spare or when I consider the road wide enough for 3 lanes. I go round corners on the limits of the friction of the tyres. (Unsafe driver, 22 years)

In contrast, some of the 'safe' drivers commented:

#32: A risk is putting yourself and other people in danger, I wouldn't have said I did...but if there's not much traffic around, perhaps you'll go a bit faster. (Safe driver, 18 years)

#38: I have done handbrake turns in the middle of the night, in gravel car parks when no-one's around. I wouldn't do it on the road because you never know what someone else is going to do. (Safe driver, 20 years)

#54: The only ones I would do is speeding along a particular by-pass. Everyone drives 50 (mile/h) on the Southampton by-pass; you've more chance of an accident if you go 30 (the legal limit). Generally I try to keep to limits, but sometimes you can't go at the speed limit. (Safe driver, 19 years)

#56: Obviously there is a grey area, but I take less risks than my peers. (Safe driver, 25 years)

From their subjective ratings and verbal accounts it would appear that the drivers were well aware that they were taking risks whilst driving and that it was a deliberate policy. As one driver summed it up: *#11: You do know, you know that they're risky and you shouldn't do it, but I'm not sure you fully understand why. I mean you know it's bad and accidents happen but you don't fully understand. I think in a way you might actually not even bother to question yourself on it, you know it's bad, but you don't want to question yourself on it because you want to do it (Unsafe driver, 19 years).*

So, if risk taking was largely a matter of conscious decision making, what kind of explanations and justifications did the drivers give for performing risky manoeuvres?

As already mentioned, some of the reported risky driving behaviour may have been due to the desire of drivers to test out their own driving capabilities and that of their car (Section 6.1). In addition, many of the drivers, but most particularly, the 'unsafe' drivers felt that it was acceptable to take certain risks whilst driving. They argued that it was acceptable, because either most drivers do it (for example, speed on motorways) or that all of their friends do it as well. The justification for driving in particular ways in some cases seemed to be based on the idea of following informal rules or norms of the road, either in particular 'physical' locations (see #54 above) or in a particular driver group (see #2 and #21 above).

Although many of the drivers admitted taking risks, when they were asked whether they deliberately drove unsafely the vast majority denied doing so. This seeming contradiction depended on the interpretation of 'unsafe'. Drivers felt that they took risks but only when it was 'safe' to do so, when no harm would come of it (their driving ability could cope with the risk) or that any risks experienced were placed on themselves and not other people. The extent of the risk was dependent on the situation at the time. Many of the drivers stressed that they took greater risks on roads that were quiet, wide and lacking traffic. Often drivers would take risks on country roads, late at night when pedestrian numbers were likely to be few and therefore they would still feel they were driving 'safely'. Such explanations clearly go some way to explaining the relatively high number of SVAs (Single Vehicle Accidents) amongst the young male age group during the evening or night time periods.

Some of the 'unsafe' drivers reported:
#3: I don't deliberately go out and do 70 mile/h in a 30 limit, but then if I do 70 in a 30 limit, it doesn't bother me. I just try not to do it in areas where I think I might be risking something like running over babies or something. I go as fast as it seems safe to do so in the conditions. (Unsafe driver, 18 years)
#4: It was with a friend, late at night, no traffic about and I knew the roads and I suppose we were just mucking around. I wouldn't do it if I thought it was unsafe, but you can do things that you think are safe and they're not; if I thought it was unsafe I wouldn't do it. (Unsafe driver, 18 years)

#6: I do take notice of speed limits but not a great deal. If it's safe to go faster I don't see why you can't... (Unsafe driver, 18 years)
#15: I continually break the speed limit. I basically drive how I feel confident, if I feel confident driving 100 mile/h on a certain road then I will... (Unsafe driver, 20 years)

In contrast, one 'safe' driver commented:
#46: I do speed a bit now and again but it's that calculated risk speeding, as in OK I'm doing 37 in a 30 mile/h limit...when there's nothing much about I do it all the time but if there's a lot of kids running around a park then obviously not. (Safe driver, 22 years)

Many of the drivers (from both groups) gave explanations as to why young male drivers are over-represented in SVAs. The general consensus was that young male drivers go out into the country to try out risky driving behaviours, often with their male friends to show off to each other. The combination of a competitive atmosphere allied to their inexperience on the road often led the drivers to overstretch their driving abilities. Many drivers admitted to having been involved in similar situations in the past and confessed that they had been lucky to avoid an accident, or that any such accident usually resulted in driving into a ditch or going through a hedge without causing any injuries. However, these drivers admitted that many of their actions could have easily lead to more serious consequences. It is worth noting that many of the drivers who had had minor SVAs had got their friends to come and help tow their car back onto the road and thus a considerable number of such accidents had not been recorded by the police.

Two of the explanations for young driver SVAs were:
#33: Because it's dark, no-one around, the road's empty, you think you can do what you want and get away with it; I've done it a couple of times and spun my cars but luckily no-one's been around. (Safe driver, 19 years)
#46: They're just pratting around in their cars, messing about, deserted roads, let's skid it round a few corners and off they go. It's boy racers. I've done it a

couple of times and got away with it, my extreme might be very moderate for someone else, if I thought there was any severe danger of putting the car in the ditch I wouldn't have done it. Bombing along country roads in the New Forest when you think there is nothing about. (Safe driver, 22 years)

For some drivers the risks were due, in part, to peer pressure or encouragement. These drivers felt that friends had encouraged them to take the risks either directly as passengers (Section 8.1) or indirectly by recounting their own exploits which then had to be tried or bettered. For a number of the 'unsafe' drivers, the taking of risks whilst driving appeared to achieve status amongst their peer group.

Some comments from the 'unsafe' drivers were:

#2: If you go into an empty car park, you don't just park you'll go round in circles and spin and be a bit silly. It's something all my friends do, it makes driving more enjoyable and interesting if you've got something to talk about afterwards. We'd say 'Oh on the way here I almost hit this car' - it would be something to talk about. (Unsafe driver, 18 years)

#3: I'm a bit less risky (than my friends) but I don't let them think that, I enjoy being thought of as a bit wild. (Unsafe driver, 18 years)

#4: I'm kind of recognised for my driving so it probably gives me a good feeling, it's hard to say. (Unsafe driver, 18 years)

#11: Friends would say going up a hill, 'just wait till you've gone over the brow and then go for it', that sort of thing which you're maybe better off not knowing... they'd sort of teach you bad ways without knowing it ... I wanted to show them (friends) that I wasn't any worse than they were, well 'worse' in brackets; that you could do everything that they could do, there was no difference, you were now a driver. (Unsafe driver, 19 years)

Typical comments from the 'safe' drivers were:

#31: It depends on your personality and the type of company you're in. My group of friends aren't too bad, none of them are troublemakers. Other groups of lads have the music blaring and they screech around everywhere trying to impress

people. My group didn't bother, we laughed at that sort of people, it might have been the school we went to, but we laughed at that sort of idea. (Safe driver, 18 years)

#42: I've always been made fun of because I always drive slower or never take risks like they do - they say 'Go on, go a bit faster, go on, go on.' I've always been told 'Oh you couldn't scare me with your driving, you're too slow' and it's always stayed that way even though they've tried to egg me on. (Safe driver, 21 years)

At no time during the interviews did anyone express embarrassment at being either involved in an accident or admitting to dangerous driving behaviours or driving convictions. The general attitude which was particularly evident amongst the 'unsafe' drivers, was that every male driver at some stage in their driving career would try out risky manoeuvres and that if they had a crash or were convicted for a motoring offence then it was merely unfortunate and unlucky. However, this attitude did not seem to apply to drink driving behaviour which was generally and genuinely portrayed as unacceptable, even if some drivers had done so in the past (see Section 6.4).

More of the 'unsafe' drivers performed risky manoeuvres for the sheer fun of driving dangerously. Some of these drivers stated that taking risks helped to relieve boredom and made driving a more exciting activity (Section 7.2). Furthermore, a few drivers claimed that taking risks helped them to drive better because it ensured that they <u>had</u> to concentrate. It was reported by one driver that if on a long journey he felt he was getting tired, he would start to take more risks and drive faster in order to ensure that, due to the extra adrenalin, he would not fall asleep!

Some descriptions from the 'unsafe' drivers were as follows:

#3: If you feel you're too safe, you don't concentrate as much. (Unsafe driver, 18 years)

#5: Yes I enjoy it, but every now and again it is a lot of risk. I love it, but it's

dangerous, that's the trouble. (Unsafe driver, 18 years)

#17: Partly for a buzz and partly for knowing what's happening and being able to do it and control it. It's satisfying to get these things right. It's a standard thing to do amongst my friends. (Unsafe driver, 20 years)

#23: ...to keep a bit more interest, sometimes I feel like flooring it...I get a bit carried away...you get the feeling of enjoyment of going round corners, the unpredictability, it's a lot more exhilarating when you do it a bit faster, it increases it, I mean you can make it swing from side to side... (Unsafe driver, 23 years)

#28: Overtaking, it's exciting, I don't do it to the extent that it's stupid, but yes, it's a nice feeling, it gets the adrenalin flowing a bit anyway. (Unsafe driver, 18 years)

More of the 'safe' drivers were less inclined to take risks (except, perhaps, through perceived necessity e.g. late for an appointment):

#34: I have taken risks because I'm in a rush or a bad temper or if I get frustrated, but not really for the hell of it. (Safe driver, 19 years)

#40: No, I don't (take risks for fun), I'm really terrified of crashing. (Safe driver, 21 years)

#54: ...it doesn't really appeal to me (risky manoeuvres), it's like an ego trip for them (some of his friends), but it does nothing for me. (Safe driver, 19 years)

A number of the 'unsafe' drivers felt that they might as well take risks out on the road because, not only was it fun, but they had little to lose (in monetary terms) by doing so. Some of the drivers drove or had driven old 'bangers' which cost about £200 and were, as a consequence, not particularly bothered if the car got wrecked or damaged (although they never expected this to occur anyway). Some drivers felt their driving had improved and become safer because they now owned more expensive cars. The type of car that the person was driving seemed to have some effect on the driving behaviours reported. Many of the drivers were confused as to whether it was safer or less safe to drive in a more risky manner in a faster or newer car. It would appear that in a more powerful car, many of the young drivers drove in a more risky manner but that they actually believed this was safer. It was not clear whether these drivers only took into account in this assessment their own well-being, or those of others (such as 'vulnerable' road users) as well, but the latter assessment would appear unlikely.

Some of the 'unsafe' drivers commented:

#2: I'm not as risky as before because I've got my own car now and I've only got third party, if I write it off it would be really bad because it's worth £1400. I suppose I would be more risky if I had fully comprehensive. (Unsafe driver, 18 years)

#5: When I first passed we used to have a laugh because I had a really old banger... (Unsafe driver, 18 years)

#29: I might have done in the past (taken more risks), but not now probably because I've got a nicer car... (Unsafe driver, 23 years)

Some of the 'safe' drivers commented:

#34: People buy a wreck and don't mind wrecking it. Funnily enough none of them would drink and drive or not wear a seat belt, it's funny how they take risks in different areas. (Safe driver, 19 years)

#41: In my sports car I'll take more risks because it's straight out and straight back in and it's safe. (Safe driver, 21 years)

#43: If I'm driving my mother's car, she's got a big Volvo, sometimes I overtake and zoom past. (Safe driver, 21 years)

#53: ...my friends were boy racerish...they'd burn lots of rubber on the road but it didn't appeal to me because I had to pay for it and my car was in fairly good condition and I wanted it to stay that way. (Safe driver, 25 years)

Although few of the drivers were company drivers, a small number from both groups stated that they took risks whilst driving due to the external pressures placed on them by their companies or that they drove differently (with less care) in a company car. This was because if an accident was to occur, they would simply be given another car. Indeed, one driver reported that if he had an accident, he would probably be given a newer model as though this might be an incentive to crash!

Some of the company drivers commented:

#14: The company do not take travelling into account, they do not expect you to speed, but if you did 50 mile/h all the way, they'd be upset. I'm so used to doing ridiculous speeds that it's second nature now. I have to drive to Liverpool and I'm expected on-site at 9am and they won't put you up in a hotel and if you finish that day at 2pm they'd expect you to drive home. (Unsafe driver, 20 years)

#33: I'm always thinking they're sat back in the office thinking 'Christ where has he got to?' and it puts you on edge, so I always drive faster in a company car because time is against me. (Safe driver, 19 years)

#41: If it's some complete dickhead up my backside then I'll slam on my brakes, especially in the company car because it's going to be his fault. (Safe driver, 21 years)

One driver claimed that a local company keeps an up-to-date list of all unmarked police patrol cars and their number plates, and 'faxes' them to other companies to help drivers avoid prosecution. The emphasis would seem to be on avoiding detection rather than altering behaviour. It is probable that this situation is not unique and with increasing traffic congestion and growing demands for work performance it is possible that the demands and subsequent risks that have to be taken by company drivers will increase in the future.

In addition to company expectations, some of the young drivers (in both driver groups) stated that they felt they were almost expected to drive recklessly (although this did not necessarily mean that they actually did). Most of the drivers stated that they felt young drivers were unfairly categorised as 'boy racer' types and one or two stated that if that's what people expected, that is what they would get. Some drivers felt that they were unfairly victimised by the police, although the majority felt that the police were reasonable and only took action when they had little choice and it was justified. A certain amount of resentment was evident in the way that these young drivers were treated by insurance companies as 'high risk' drivers, dependent primarily on age and experience factors. One driver who was particularly 'unsafe' stated that since the insurance companies labelled him as a high risk and he had to pay such large amounts for his insurance that he might as well get his money's worth! (not through fraudulent 'claims', but through risky driving behaviour secure in the knowledge that he had paid a high premium with the expectation that he would drive that way). It would seem that some of these examples may have been leading to an unfortunate self-fulfilling prophecy whereby some of the young drivers drove in a risky manner because that was what was expected of them by friends (see Section 7.1.2.2), the public, the police and insurance companies alike.

Some typical comments from the drivers were:
#3: The police are fairly good, if you're doing something mind boggling stupid then you'll get pulled. If you're doing something sensibly, they know the speed limits are just a guide and they ought to let you off and generally do. (Unsafe driver, 18 years)
#5: Someone like me, as a youngster they will probably think 'bloody hell', I mean if I overtake someone, 'look another youngster off to kill himself', expecting every youngster to drive mad. It doesn't bother me, that's why the insurance is so high because everyone expects us to drive mad, and 90% of us do. So I feel sorry for the 10% that don't. (Unsafe driver, 18 years)
#25: It annoys me that the companies that do give discounts, their premiums are higher anyway. What more can you do? You haven't had an accident for 5 years, you go along to driving courses to learn a better way of doing it and it doesn't make a blind bit of difference. What are they actively doing to encourage people to drive safer? (Unsafe driver, 24 years)
#30: You tend to get categorised...it doesn't bother me; sometimes it makes you want to live up to your image; why shouldn't you? It just makes you laugh, just for a giggle. You sit at the lights and wind up the older people and then pull away slowly. (Safe driver, 17 years)
#33: ...older people look on us as 'speed freaks' and young 'whipper snappers',

we're viewed as high insurance risks and basically seen as driving around in cars that are unsafe because they're older. If people didn't give the 'youngeys' such a lot of 'jip', then they wouldn't feel they've got something to prove and teach people a lesson. If everyone was viewed equally then I don't think there would be half the problem. (Safe driver, 19 years)

5.4 Perceptions of accident probability

Drivers were asked to estimate how many traffic injuries (all severities) and how many traffic deaths there were in Great Britain in 1989. The average estimates along with the actual figures (Department of Transport, 1990) are shown in Table 5.1.

Table 5.1: Estimated and actual traffic injuries and deaths in G.B. in 1989.

	Traffic Injuries	Traffic Deaths
'Unsafe' drivers (average)	548,034	36,394
'Safe' drivers (average)	184,000	15,848
Actual figures	341,592	5,373

The 'unsafe' driver group grossly overestimated the number of traffic injuries, whilst the 'safe' driver group grossly underestimated. However, both groups of drivers overestimated the number of traffic deaths to a marked degree, with the 'unsafe' drivers being the least accurate. Such results suggest that the drivers had very little knowledge of the actual accident figures on the road; some of the drivers admitted that their answers were complete guesses. Notwithstanding these problems, it would appear that increasing knowledge of accident figures is unlikely to have any safety benefit given that the male drivers in this study generally believed the 'objective' risk of having an accident to be higher than it actually is. Styles of sensationalist media coverage of traffic accidents may play a part in this. Increasing knowledge in this area may therefore lead to drivers having a lower perceived 'objective' risk of an accident. What was of greater interest, however, was the drivers' perceived risks of themselves having an accident.

Drivers were asked what they thought the chances were, of them either being involved in, or causing, a slight or serious injury accident in the next ten years. The 'unsafe' drivers assessed themselves as more likely to be involved in, or cause, a slight or serious injury accident than the 'safe' drivers assessed themselves to be. Despite this higher likelihood, the 'unsafe' drivers assessed themselves to be less worried about an accident than the 'safe' drivers. Drivers in both groups expressed a 'fatalist' view of accidents stating that there was no point in worrying about accidents because they were, to a large extent, random events which happen to anyone. This argument may have been proposed by some of the accident involved drivers because having actually had a number of accidents, it thus helped to exonerate their driving behaviour and/or accident record. Alternatively, these same drivers may have reported less worry because having already survived an accident or two, they assume they would again. The other approach was that they did not want to think about having an accident for fear of it affecting their driving confidence.

Some examples from the 'unsafe' drivers were:
#17: I've been in a few accidents and I haven't been injured at all; you know what the car is capable of and how it's going to protect you. (Unsafe driver, 20 years)
#18: You don't think it will happen to you, it's like something else, you know a lot of people die of cancer. What is the point of worrying? I could drive incredibly safely and get hit by an HGV (Heavy Goods Vehicle) so all the time being safe has been pointless, you could have been reckless and have a good, fun and exciting time. (Unsafe driver, 20 years)
#24: I don't worry much at all because I don't want to think about it. (Unsafe driver, 23 years)

Some examples from the 'safe' drivers were:

#38: If it happens, it happens, there's not a lot you can do about it. (Safe driver, 20 years)

#52: If fate's going to cause you an injury, then it is going to cause you an injury. (Safe driver, 22 years)

5.5 Discussion

Consistent with other studies, the majority of the young drivers rated themselves as better (ie more skillful and safer) drivers than their peers (Matthews and Moran, 1986, Svenson, 1981). They rated their peers as less able drivers than older drivers in general, but did not include themselves in this assessment. This higher safety rating may be attributable to greater confidence in their level of skill or belief in their ability to handle any hazardous situation that may arise.

Matthews and Moran (1986) also found that young male drivers (aged 18-24 years) made no distinction in overall risk levels between themselves and older drivers (35-50 year olds), but rated their individual risk as being lower than their peers. Such findings were not replicated. Although both 'safe' and 'unsafe' drivers assessed themselves as safer than their peers, the 'unsafe' drivers actually rated their risk level to be higher than an average peer driver. Put simply, the 'unsafe' drivers assessed themselves as more risky drivers. Although this finding initially appeared to contradict their earlier safety rating, the drivers presented a number of explanations which explained why it did not. The 'unsafe' drivers admitted taking more risks than an average driver might, but only when it was 'safe' to do so and when traffic conditions allowed. The extent of the risk was usually assessed dependent on the amount of traffic, pedestrians, width of road, location and time. It is not that the 'unsafe' drivers want to maintain a constant level of risk, because, under the effect of other social influences, risk levels fluctuate. These social influences can cause risk levels to vary irrespective of the above considerations. Such an explanation may go some way to explaining young drivers' over-involvement in Single Vehicle Accidents (SVAs) which most frequently occur under these circumstances (Broughton, 1988; McKenna, 1987). Indeed, some of the drivers reported such non-injury SVAs. Furthermore, these same drivers believed their 'advanced' (in their opinion) driving ability could cope with the additional risk. In effect, the 'unsafe' drivers argued they took risks when it was 'safe' to do so, so they could still regard themselves as 'safe' drivers, disregarding social influences, whether proximal or distal. These findings appear to be in direct contrast to those of Finn and Bragg (1984) who found young drivers consistently reported lower risk for themselves relative to other drivers. However, in essence the results merely illustrate the greater complexity of the issue when the viewpoint of the 'unsafe' young driver is taken account of; they report higher safety levels than an average driver, as well as higher risk levels, but in their own way of thinking, do not regard this as a contradiction.

In general, all of the young drivers believed they were as skilled and 'safe' as older drivers and yet it was clear that they perceived their peers to be less skilled and 'safe' than older drivers. However, results in Study I showed that the young male driver group did not possess the driving skills or ability to match those of the older drivers. This suggests that for some of the drivers (particularly the 'unsafe' group in Study II) there was a considerable gap between their perception of their driving skills and ability and the actual reality of their driving skills and ability. This apparent mismatch between young drivers' perceptions of their own driving abilities and actual skills (as demonstrated on the route surveys) remains a major cause of concern. Lack of recognised feedback (ie near misses) should be emphasised within current driver training programmes in the hope that it continues once a driver passes their driving test.

Matthews and Moran (1986) found that older drivers did not rate themselves above their peers, arguing that age effects, which were not assessed by Svenson (1981), caused the over-estimation factor. The design of Study II, by not including older drivers, did not allow a test of this. Nevertheless, ratings in Study I (Section 3.2.5) suggest that over-estimation of their own driving ability across a number of measures was also evident in the older drivers, but not to the same extent as the younger drivers. Indeed, later Matthews and Moran (*op cit*) stated that older drivers' over-estimation of ability *'showed a small, but not significant tendency'* (p. 311).

The general finding in Study I that drivers in all the age and sex groups rated their own driving abilities on a number of measures (such as overall ability, safety, observation and so on) higher than the observed measures (see Section 3.2.5) when allied to the findings reported here that the majority of the young male drivers assessed themselves as <u>more</u> skilled and <u>more</u> safe than their peers, but only <u>as</u> safe and skilled as older drivers provides some support for the applicability of the 'superior conformity of the self' hypothesis to car driver behaviour. According to this hypothesis (Codol, 1975), it would be expected that the drivers would rate their own driving abilities above average, but below those of a particularly 'good' driver. Furthermore, results suggest that this over-estimation of driving ability with young male drivers is on an individual basis and not because they believe their age group of drivers are better drivers than other groups. Given the 'lay' stereotype of the younger male driver this is perhaps not surprising. Nevertheless, these results confirm that group stereotypes (based on age categories) do not explain the over-estimation findings (Svenson, 1981).

Unfortunately, the drivers (Study I and II) were not asked to compare themselves with a particularly 'good' driver. However, it could be argued that in Study I, a self-rating of 7 (= highest measure available on 7 point scale) and in Study II, the young drivers' comparison ratings with older drivers may represent a comparison to a particularly 'good' driver. If this is accepted, findings show that drivers in all of the groups in Study I, on average, rated themselves well below the 7 point maximum rating, but also above the 'average' rating (mean ranges were 4.4 to 5.5 as opposed to predicted 3.5 mean). Similarly, in Study II, the young male drivers rated their driving ability as approximately the same level of safety and skill as older drivers (representing 'good' drivers), but above that of their own peer group of drivers (representing the 'average' driver). Findings suggest that the 'superior conformity of the self' hypothesis can be applied to car driving behaviour; drivers rate themselves above average drivers, but below very good drivers. McCormick, Walkey and Green (1986) also indicated this by stating that *'the view of the self as superior to average is part of a considered and rational position'* (p.207).

Current findings do not support the hypothesis that ability and perceived risk are related (Matthews and Moran, 1986), only that perceived ability and perceived risk are related. Matthews and Moran (*op cit*) found a relationship (which precluded statistical testing) that drivers who had a poor accident record gave lower self ratings for ability. They argued that drivers realised their demonstrably poorer abilities through their greater number of accidents. Such a finding does not find support in the current study, since the 'unsafe' drivers had a statistically significant different accident record to the 'safe' driver group, but despite this, tended to rate themselves as having better abilities and being 'safer' drivers than an 'average' peer group driver. The ratings between the 'safe' and 'unsafe' driver groups were very similar, but 'unsafe' drivers tended to rate themselves, if anything, as <u>more</u> skillful drivers than did the 'safe' drivers. Explanation of over-estimation of ability due to low memory for negative events (Tversky and Kahneman, 1973) may be applied to 'near misses', but not to accidents, since drivers with a poor (self-reported) accident history did not differ from those with a better (self-reported) accident history. Such an explanation precludes the possibility that the accident involved drivers blamed other drivers or circumstances for their own accident records. Given that accident involved drivers rated the performance of other drivers considerably poorer than their own driving abilities this would appear to be a reasonable assumption.

Matthews and Moran (1986) found a relationship between number of prior accidents and rating of driving ability. No such trend was found in our study, although the 'unsafe' driver group (with a greater number of accidents) reported taking more risks. Our findings suggest that perceived safety, perceived risk and perceived ability are related. The findings suggest that high estimation of ability and confidence in one's skills of car control and handling have an influence on the level of perceived safety whilst driving. Furthermore, they suggest that perceived safety is not solely dependent on the amount of risk that is experienced whilst driving, but that this is also dependent on where this risk occurs.

Cognitive and social processes which make it possible, (and arguably desirable), to blame environmental circumstances for accident occurrence and the possibility that drivers rationalise that they have learnt from previous mistakes suggests that prior accident record need not influence driver self-rating of ability to any extent.

The general finding that many of the drivers stated that they felt it was overall 'safer' to drive in a riskier manner in a faster or newer car would appear to provide some limited support for the 'risk homeostasis' theory (Wilde, 1982a, b). However, a considerable amount of other evidence (including passenger effects) generally questions this theoretical position (Broughton, 1990; Evans, 1986).

Practically, it has been shown that in order to reduce risky driving behaviour, it is desirable to concentrate on the combined issues of risk and ability. It is evident that young drivers over-estimate their driving skills and driving ability and that this may lead to them assessing themselves as 'safer' than they really are.

Unlike previous studies (e.g. McCormick, Walkey and Green, 1986; Svenson, 1981), a number of explanations are given as to <u>why</u> drivers over-estimate their driving ability beyond the usual reason that there is no objective way of measuring driver ability. It is suggested, for example, that the 'unsafe' drivers assessed themselves as more skillful than other drivers because they 'test' their abilities on the road. Such drivers equate greater driving skill levels, perhaps gained through the testing of their driving in 'risky' situations, with subsequent greater driver safety. The results here suggest that driving skill may not relate, in a simple or direct way, to driver safety. That driver risks were due to peer pressures will be discussed with regard to proximal (e.g. passengers) and distal (e.g. peer/lifestyle) influences on driving behaviour in later chapters (6 and 7). The finding that company pressures encouraged drivers to take additional risks was similar to work reported by Beilock (1985) who showed that one-third of truck drivers in Florida were set schedules which meant that they had to violate speed or hours of service regulations. These findings are important given the likely increasing emphasis on performance related pay and achievement quotas. This is likely to be most prevalent amongst sales representatives who, perhaps, comprise the largest body of company drivers. Recognition and publicity of this problem may help to alleviate it.

For some of the young drivers who owned relatively cheap cars, it was perceived that having an accident would not be a very great inconvenience. Such drivers felt that, at worst, a £200 car might be wrecked and failed to appreciate all of the (injury) possibilities. All the complications involved with even a minor accident were predominantly ignored.

A number of drivers reported driving 'unsafely' because they found it exciting and helped to relieve boredom. This suggests that other aspects of their life outside of the driving process may be lacking in stimulation and thus other forms of 'adventure entertainment' may help to reduce their need to rely on the car for excitement. This topic is returned to in greater detail later when the purpose of the car in the lives of young drivers is discussed (see Section 6.5 and 6.6).

Driver accident probabilities were generally vastly overestimated. This may be explained by the estimation of the risk on two levels, namely, individual experience and media reported information. The first risk, based on individual experience, may involve an estimate of the number of friends the driver has and how many of these have been involved in accidents. The likelihood is that these friends are of a similar age and therefore consist of a group who have a high rate of accident involvement compared to other driver age and sex groups. The second of these, based on media reported information, is likely to constantly emphasise the higher, younger driver accident statistics and sensationalise any such accident occurrence. The result is that both of these information providing areas are likely to lead to an over-estimation by young drivers of the chance of having an accident. Thus, greater knowledge of the objective chance of having an accident may not improve the situation on the road for younger drivers.

Given the extremely inaccurate knowledge level of accident figures, particularly amongst the 'unsafe' driver group, it might be argued that poor knowledge levels lead to higher accident involvements, except that both groups of drivers grossly over-estimated the numbers of drivers killed annually. There is little previous evidence of a connection between driving knowledge and accident involvement (Conley and Smiley, 1976; Smith and Kirkham, 1982). Findings in this study support this and go further since results suggest that increasing knowledge of fatal accident figures which are actually lower than those estimated, may lead to young drivers being more aware of the lower perceived 'objective' risk of an accident. However, whether a lower perceived objective risk assessment by young drivers would increase accident levels is doubtful given the results reported by Anderson (1978) that factually based traffic materials did not affect subsequent accident involvement levels.

Both groups of young drivers found it hard to estimate the annual accident figures in contrast to findings by Cousins (1980). It may be the case that the objective risk of having an accident is inconsequential to many young drivers since this is usually reported as some overall or average figure (e.g. in an average driving career, 3.3 out of every 1000 male drivers will be killed whilst driving before they reach 70 years; Broughton, 1988) based on 'past' risks which young drivers appear to regard as having little bearing on their own present and future events (Anderson, 1978). In sum, the objective risk of an accident has very little in common with the subjective risk of having an accident. This would appear to be a plausible argument since it has been suggested (above) that many of the young drivers can disassociate their own ability from that of their peers.

Since the majority of the young drivers assessed themselves as better than average drivers, reported accident figures may be disregarded as inapplicable to their own driving situation. Indeed, the portrayal of such accident figures may be a determinant in convincing them that they are, indeed, better than average drivers, since so many accidents occur to other drivers, particularly young drivers. 'Unsafe' drivers assessed themselves as more likely to have an accident, but were less worried about it, than the 'safe' drivers. A widespread fatalistic approach to accident involvement prevailed in both groups. This supports work by Firth and Geoffery (1980, cited in Rothe, 1987) that among young drivers there is a tendency to blame 'other drivers' for an accident and a reluctance to accept that one's own behaviour is the main factor leading to accident involvement. In addition, they found that feelings of inevitability and acceptance were associated with road accident involvement. Although accidents can occur at low levels of risk it is important that drivers appreciate the importance of their own behaviour in accident involvement. This is emphasised by Guastello and Guastello (1986) who found that drivers who felt that events were a consequence of their own actions had fewer accidents.

On a more general level, these findings support the hypothesis suggested by Weinstein (1980) that the greater the perceived controllability of a negative event (ie an accident), the greater the tendency for people to believe their own chances of avoiding one are better than average (see also McKenna, 1991). The 'unsafe' drivers, in particular, felt that accidents were events largely beyond their control and thus rated themselves slightly more likely than 'safe' drivers to have an accident. However, the 'safe' drivers appeared to believe they had more control over future accident involvement than the 'unsafe' drivers and, in turn, rated their chance of involvement over the next ten years to be somewhat lower. This difference within the young male driver group mirrors findings produced across a number of different specific accident types with differing degrees of perceived controllability (DeJoy, 1989).

All of the drivers assessed their driving as 'good' or 'safe'. Examination of their route survey performance and their reported accident history, in addition to their self-reported driving behaviour, questions this view, especially with regard to some of the 'unsafe' drivers. 'Safe' and 'good' are somewhat ambiguous terms subject to interpretation. The young drivers felt they were 'good' and 'safe' drivers using their own interpretation, but this may not correspond with the view of the majority of other drivers on the road. The finding that drivers differed in their interpretation of 'good' driving is similar to the finding of Rothe (1987) that male and female drivers differ in their interpretation of the word 'caution'. However, Rothe (*op cit*) did not examine differences within young male drivers. The 'unsafe' drivers' emphasis on the driving skill contribution to a 'good' driver further justified the link between perceived ability and perceived safety for 'unsafe' drivers. The 'safe' driver group identified caution and safety with being a 'good' driver. It would appear since everyone rated themselves a better driver than average, when they were asked to describe the qualities of a 'good' driver they inevitably described their own driving.

In essence, many of the young drivers had their own rules of what constituted 'good' or 'safe' driving. These informal (as opposed to formal or legal) rules of driving behaviour, accepted amongst some of the younger drivers, sometimes involved breaking the traffic law to a certain degree. To a lesser degree, such informal rule-following behaviour may occur for drivers of all ages and sex and involves the accepted infringement of traffic laws (see Section 6.1.2). For example, much speeding on the motorway within 10% over the limit is often regarded as 'acceptable' driving behaviour, despite the illegal nature of the action. Thus, some of the 'unsafe' young drivers' standards of driving could be properly understood within the framework of driving behaviour in general, but at the extreme end of the continuum.

Indeed, on a slightly different level, it might be argued that within our society there is a general tendency to equate driving with masculinity (Marsh and Collett, 1986). Fielding (1972), a psychiatrist, argued that cars enhance masculinity and that driving is a symbol of equality with adults. Some of the young drivers may have exaggerated such values and as a consequence, equate risky, fast driving with masculinity and thus might be said to be 'over-conforming' to values that are inherent in wider society as opposed to the lay view that such drivers are 'non-conformists'.

Results support the study by Matthews and Moran (1986) that young drivers have a tendency to view themselves as immune from the effects of their risk taking behaviour, which they ascribe to their peers but not to themselves. This would seem to be an example of the lay expression 'it won't happen to me'. However, most of the young drivers thought they would not have an accident because they did not accept that much of their driving behaviour was 'unsafe' due to a different interpretation of risk.

Taking into account the above findings and explanations by some of the young drivers of their own behaviour, it is apparent that much of the 'unsafe' driving by young males is not a perverse act. Indeed, many of the drivers forwarded a number of good reasons which justified and rationally explained their driving behaviour from their own point of view. 'Unsafe' driving by young male drivers has to be understood within this context.

6 DISTAL SOCIAL INFLUENCES ON DRIVING

6.1 Introduction

A number of possible social influences on car driving behaviour were examined. Many of these influences were inter-related and it is therefore difficult to discuss them separately. A particularly good example of this is drinking behaviour (Section 6.4) which incorporates a wide range of influences such as peer and passenger effects. With this in mind, a somewhat arbitrary split has been made between this chapter and Chapter 7 concerning those influences that might loosely be termed 'distal' and 'proximal' social influences. Distal influences refer to those that are non-immediate and do not necessarily occur during the actual driving process and within the car environment; these could be called 'macro-environmental' influences. Proximal influences thus refer to social influences that occur in the immediate proximity of the car during the act of driving; these could be termed 'micro-environmental' influences. Despite the division into two chapters, it is important to emphasise that many of the social influences are over-lapping and related to one another.

In the last few years, in common with a number of other research areas such as health, there has been a growing emphasis in traffic safety research on the importance of lifestyle issues on young car driver behaviour. It is becoming more frequent for driving behaviour to be examined in terms of the more general lifestyle choices made by an individual, rather than as a separable behaviour studied out of the social context.

6.1.1 Environmental proneness

Behaviour can be seen either as the product of intra-individual structures such as needs, cognitive structures, personality traits ('the person') or as a reflection of the situation they are in at the moment ('the situation'). Heider (1958) stated that the lay view is that people are the origins of their actions since it is more difficult to understand the situational and circumstantial factors that led to the particular behaviour. Social psychologists tend to favour the latter view emphasising the social forces that are inherent in any given situation, whilst recognising the part that learning through previous experiences plays in affecting behaviour in particular circumstances. This view takes into account the great diversity in people's behaviour in various situations during the day from interactions with their families, fellow workers, their superiors and their friends.

However, people do not always follow a consistent pattern of behaviour dependent purely on the situational demands at the time. It is probably more accurate to state that virtually all behaviour is shaped partly by individual characteristics and partly by the situation. This can be termed 'individual-in-situation' behaviour. If a certain kind of individual and a certain kind of behaviour is accurately assessed, then it should be possible to predict and understand subsequent behaviour. If every individual and situation is assessed as unique, there would be an infinite number of 'individual-in-situation' behaviours (Secord *et al.*, 1976). Therefore, it is probably best to view individuals in categories or small groups (e.g. young male car drivers) and certain categories of situations (e.g. car driving). Another influence on behaviour related to the situation is the person or group with whom the individual is interacting (e.g. parents, friends and so on).

Situational influences on driver behaviour can be viewed as forms of 'environmental proneness', covering such diverse aspects as a family's acceptance or non-acceptance of deviance, the adopting of a particular lifestyle or leisure pursuits, the education of, and exposure to, risk and, in a similar way, the influence and exposure to particular forms of the media and peer groups which might encourage or glamorise the expression of deviant behaviour (Assailly, 1991). Viewed in this way, driving can be seen as an activity whereby individuals are likely to respond in much the same way as they would in any other social situation.

In order for the 'social influences' of driving to have some meaning, it is necessary to distinguish two broad levels of operation. First, is the individual's position in society and/or group and the interaction between the individual and society and/or group in terms of lifestyle or general patterns of behaviour. Malik (1968) believed that individuals adopt attitudes to a driving situation which they use in their larger social system and thus the social context may be a crucial factor in determining whether or not an accident actually takes place. Next, there is the interaction between the individual and other road users, including passengers, which may influence specific patterns of behaviour. Both levels of operation will be examined in this thesis although, in practice, the boundaries between them are often difficult to distinguish.

It is important to emphasise that human life is complex enough for one individual to engage in many different non-overlapping social groups and to occupy a different position, character or reputation within each group. The group, position in the group, activities and performance of these activities which are associated with respect or contempt determine to a large extent the behaviour of the individual. Any individual can choose not to follow the rule-system that the group or collective, of which he/she is a part, adheres to, but at the possible social cost of loss of reputation and alienation.

Theories of self development emphasise people's perception of how other people see them. The self develops through social interaction by the individual's enactment of a series of social roles which are assigned to them by society such as baby, adolescent, intelligent pupil and so on. As they perform these assigned roles, their self concept is influenced by the ways in which their role partners view them and by the way in which these partners perform their roles. Role portrayals are influenced by how individuals like to think of themselves in that role. Goffman (1959) suggested that in everyday interaction, people present themselves and their activities to guide and control the impressions they give of themselves. Put simply, people try to manage the impression they present to other people, although individuals may not be explicitly aware that they are doing so.

'Impression management' is a term used to describe the way people act to create a favourable image of themselves and is particularly likely to occur in situations where the individual is expected to behave in accordance with a certain image. One motive for managing the impression that is presented is to seek support and approval of other people. Encompassed in this are actions directed to social ends such as creation and reinforcement of attitudes and expectations in other members of the group and gaining of worth, reputation and respect. Role identity and formation are not determined solely by others and the prevailing situation, rather the individual is an active agent in maintaining a stable interpersonal environment. Thus, individuals actively enter into the creation and maintenance of the self. As an individual moves through the social structure, systematic changes occur in the way the individual is labelled and the ways that other people behave towards the individual. Life cycle changes ensure a series of different role categories for individuals during their lives (Harre *et al.*, 1985). The self-fulfilling prophecy illustrates the force that expectations of other persons may have for shaping an individual's behaviour in a new direction.

Driving behaviour may be determined by the desire of drivers in specific social groups to behave in ways that they consider would meet with the approval of others whose esteem they value. Driving is one particular social activity that is influenced by prevailing social mores and norms which may not be conducive to safety. For example, some drivers may even be willing to risk having an accident and possible public failure for the chance to gain respect and admiration from important peer group members. The norms of driving may also mature in a fashion somewhat similar to the way individuals mature, with consequent declines in fatality risk (Evans, 1990).

Research in other areas has shown that adolescent 'problem' behaviours are interrelated, that there is a 'syndrome' of adolescent problem behaviour, and that it may be useful to deal with such behaviour as part of a lifestyle rather than as separate behaviours. Jessor (1987) has provided some evidence, albeit using only four items on a risky driving scale, that risky driving (such as speeding, following too closely and drink-driving) can be considered a behaviour that is part of this general syndrome. For example, he found a significant relationship for sexually active males (but not for females) between the risk-taking in traffic and infrequent use of contraceptives during intercourse. Jessor (1985) also suggested that risky driving should be examined in terms of the inter-relationships and links to lifestyle and social factors including the symbolic meaning, and significance of driving for young drivers. Swisher (1988) examining adolescent drinking patterns and risky driving behaviour within the problem behaviour theory also concluded that risky driving was one part of a larger group of negative behaviours.

A recent longitudinal study reported that accident involved young drivers could be distinguished by variables such as sensation seeking, attachment to traditional values, alcohol use and risky driving (Beirness and Simpson, 1988; 1990). However, it must be emphasised that risky driving behaviour is not an inevitable consequence of high levels of risk taking in a broader leisure context. It was found that many young people, although exhibiting high levels of a risk taking trait on the TAS and ES (Thrill and Adventure Seeking and Experience Seeking) scales devised by Zuckerman (1979), do not engage in risky driving, but express their risk-taking in other ways, often through other forms of leisure pursuits. Thus, the relationship between risk taking and risky driving is not straightforward and has been described as *'at best tenuous'* (Beirness and Simpson, 1988; p.203). Nevertheless, these conceptualisations of risky driving and accident involvement as part of a general high risk lifestyle have important implications for preventative programmes. Similarly, Barjonet (1990) showed that adopting a particular lifestyle implies the avoidance of risk, whilst at other times, it implies risk seeking.

Earlier work by McGuire (1971) found that mother's educational attainment level and father's occupation significantly predicted accidents. Similarly, Harano, Peck and McBride (1975) found that a number of biographical variables, such as socio-economic group, education, social deviance, conformity and marital status significantly predicted accidents amongst a group of 427 male drivers. McMurray

(1970) showed that there was a relation between divorce and accident involvement (drivers involved in divorce proceedings had poorer accident records) but no account was taken of driving experience or exposure measures within the study. The finding that high accident levels were particularly noticeable during the divorce suggests that stressful life events may influence driver accident involvement rates. McGuire (1970) called this *'crisis reactions'* or *'reactions to transient conditions'*; but Isherwood, Adams and Hornblow (1982) only found this relationship for a 'suicide attempt' group and not between accident and control groups.

The idea that there are environmental influences on individuals which affect many varying types of behaviour including car driving and that 'unsafe' driving is just a part of a wider range of risky problem behaviour seems to echo the famous remark that *'a man (sic) drives as he lives'* (Tillmann and Hobbs, 1949 who were actually reporting on two groups from <u>extremely</u> different behavioural backgrounds). However, this is to markedly oversimplify the situation and suggests the possibility of identifying 'accident prone' drivers since it does not emphasise the active part that a person plays in determining his/her own behavioural actions and outcomes.

6.1.2 Social norms

The Highway Code (1987) details the 'rules of the road' which drivers are supposed to follow. Any approaches which look at driving behaviour purely in respect to these formal, legal rules would conclude that people who do not conform are either poor at decision making, weak at recognising such rules or, alternatively, the road environment is so badly designed that the requirements of that particular stretch of road are not communicated to the driver. The latter argument is often used as the basis for road improvement schemes.

However, this view ignores the fact that people deviate from legal rules and create their own informal social norms (Ross, 1960). In driving, patterns of social expectations (norms) are developed by drivers in order to mutually understand the driving situation. Thus, it can be argued that better road signs leading to an improved road environment do not automatically lead to the expected increase in road safety, since people will continue to deviate from the new rules. Therefore, it is likely that the effect of a new road environment would not have as far reaching effects as a change in driver behaviour and perceived social norms. As Williams and Malfetti (1970) stated, *'methods of traffic regulation and enforcement seem insignificant when human deviation from prescribed behaviour is considered'* (p.6).

Clark (1976) investigated a group of young male manual workers to determine how their driving was affected by social roles and peer pressures. He argued that formal rules of driving have less of an immediate influence on young people's driving behaviour than the social norms adopted by their peers concerning appropriate driving behaviour. Furthermore, this influence may be exaggerated by the young male driver's dependence on his peer group for social status. Results indicated that drivers who were open to influence from peers who encouraged risk taking were more likely to be involved in an accident. Similar findings were later reported by Clark and Prolisko (1979) when they wrote that young drivers *'need to cope with peers' demands for macho behaviour'* (p.659).

There are then, in theory, two kinds of rules which influence driver behaviour; the formal, involving legal rules, and the informal, involving generally accepted social norms. The most obvious example where these two norms differ is in the case of driving speed. On a number of roads the legal speed limit is sometimes ignored and replaced by an informal rule of driving slightly above this speed limit. Stradling *et al.* (1990) showed that 70% of drivers estimated that road users disregarded the speed limit on a fairly regular basis which, when allied to other findings, suggested to them that the commission of minor motoring offences on UK highways is extremely extensive and that one of the factors which regulates such behaviour are personal standards of behaviour. Indeed, a person driving at/or under 30 mile/h on a clear road in a 30 mile/h speed limit may be a danger, through hindrance to other road users who perceive the social norm to be one that ensures a higher speed.

The way in which each individual drives could be a function of the social norms that prevail in the situation, simultaneously involving themselves and others. There arises the problem as to what specifically the term 'social norm' means. The concept of norms has become incorporated into everyday language use to the extent that it now has a multitude of applications and meanings. However there are at least two meanings that can be forwarded (Codol, 1975). A norm can be:

(a)- a 'formal' or 'factual' norm which occurs in a factual situation that is frequently occurring in a social entity (group, society) or in a given situation. It is possible to further differentiate between:

(i) norms whose 'factual' character arises due to agreement of shared habits (for example, lorry drivers flashing their lights to allow vehicles back into a lane after overtaking).

(ii) norms that are 'factual' because they have some compelling external force which imposes them on people (for example, a daily mileage limit on lorry drivers).

or b) - an 'informal' or 'desirable' norm which derives from an ideal situation that ought to prevail. This type of norm may not regularly occur but instead may serve as a goal or a model and thus be related to a system of cultural or personal values. It is true that this distinction may merge at times in that the demands of the specific situation may also reflect a moral ideal, but this is not always the case. For example, excessive speeding in a car may be rejected as a general moral ideal but be considered acceptable if it is an emergency situation involving urgent hospital treatment.

It is important not to over-emphasise the difference between 'factual' norms and 'desirable' norms. However, there is a difference between the two types of norms in that 'factual' norms involve an actual and concrete behavioural experience which can be observed, whereas 'desirable' norms relate more to social expectations of individuals and therefore are much more likely to be imagined rather than explicitly formulated. This is not to say that 'desirable' norms do not play as important a part as influencing variables on an individual's behaviour as do 'factual' norms.

The idea that the different types of 'normativeness' can be ascribed to certain behaviour leads on to the notion of degree of 'normativeness'. The more types of norm that are attributed to a characteristic or behaviour the more strongly the normative influence will be. For instance, a certain characteristic originally imposed by habit and group tradition may become the 'factual' norm of this group and thus assume a degree of normative strength. If this characteristic is further considered a desirable ideal by the group then the normative strength will be increased. In addition, it is possible that the group's existence is dependent on this particular characteristic and this will lead to an even greater degree of normativeness. Examples that can be given to demonstrate the top range of normative strength might be the characteristic of short hair for members of a skinhead group. There are other factors which contribute to the degree of normativeness including the idea of undesirable or counter norms with regard to 'desirable' norms.

There is some evidence which seems to suggest that in order to drive safely one needs to follow the informal rules of the road adopted by other car users (Shor, 1964). Indeed, it could be argued in some cases that it is more important to conform to these informal rules than the formal ones. Despite this quite reasonable hypothesis, driver education programmes largely, if not totally, ignore this idea of informal social rules of the road.

An example of this is the frequently cited case of a Canadian person involved in four separate accidents within four years and deemed not to be at fault in any of them except that they drove with caution guided by formal and legal norms which were significantly different from the informal norms adopted by the rest of the local driving population. This conflict of norms meant that, in effect, the person was a hazard on the road despite the fact that they were technically most correct in their driving behaviour (Johnston, 1975, cited in Knapper and Cropley, 1981). Shor (1964) demonstrated how confusion can arise in the driving situation when normative expectations are not shared. Shor (*op cit*) proposed the example of a driver living in congested Boston who follows highly competitive norms of driving and a driver living in rural Lawrence, and who follows more relaxed norms. The ensuing convoluted scenario demonstrated that both systems clash in that the Bostonian in Lawrence and the Lawrencian in Boston are a source of potential conflict because normative expectations are in conflict. Although Shor (*op cit*) relied primarily on intuition for his ideas, they can be quite readily understood by drivers who drive in a big city, like London, for the first time.

6.1.3 The status of actions

Harre, Clarke and De Carlo (1985) make a distinction between actions and acts. Actions are ways in which individuals express themselves publicly and acts are the social meanings of such actions. Different groups of people have different forms of actions and acts. Both acts and actions can be biologically derived and genetically maintained ('biogenic') or cultural innovations maintained by imitation and teaching ('sociogenic'). The desire for movement can be viewed as a biogenic action whereas driving is more of a sociogenic action. This is a good example of how, as life becomes more complex, sociogenic actions develop from biological actions.

Driving a car is a multifaceted activity. In order to become a driver, a person need only possess certain necessary physical and intellectual capacities to be able to learn the basic skills of driving. At this stage in their driving career, a driver has been taught the basic skills and rules of the driving 'game' but not learnt the strategy or tactics that are an integral part of the activity of driving. In many respects, the learning of the tactics and strategy come rapidly with increasing experience. However, even before this stage, the driver is equipped with knowledge of action that is likely to be determined by the group(s) or collective(s) to which they belong.

Some parallels can be drawn with Harre's concept of practical and expressive aspects of social activity (responsibility for the re-application to the driving domain of work by Harre *et al.*, 1985 rests with the author). Harre (*op cit*) acknowledging earlier work involving task-directed and identity-directed social action draws the distinction between social activity that is directed to material and biological ends (the practical aspects of activity) and those activities directed to ends such as the presentation of the self (the expressive aspects of activity). A sociogenic action like car driving can be viewed as either a practical or expressive action.

Presentation of the self behaviour can be summarised as action directed to the formation of an impression of oneself in the eyes of others ('impression management' as mentioned above). Encompassed in this are actions directed to social ends such as creation and reinforcement of attitudes and expectations in other members of the group and gaining of worth, reputation and respect. Generally, people prefer immediate expressive advantage to long term practical gains (Harre *et al.*, 1985).

In the car driving domain, it seems possible to use expressive activity whilst not necessarily sacrificing practical gains. It is often difficult to distinguish between expressive and practical activities since they are often not strictly separable. For example, driving fast may be a practical activity to travel quickly from A to B <u>and</u> an expressive activity demonstrating prowess and expertise at the wheel. This example shows that the same activity may be the result of either a practical or expressive motive which may differ for different occasions. Thus, driving fast to catch a train is based on a practical motive (desire to catch the train) whereas driving fast whilst accompanied by friends might be based on an expressive motive (desire to gain peer approval).

The expressive aspects of an activity usually appear in the way that the practical side of the activity is carried out, for example, 'the driver drove recklessly'. However, the distinction between practical and expressive activity is not clearcut.

The expressive activity may dominate the practical aspect of the activity. This is not to say there are not practical aspects involved, but they may be at a lower level in the analysis. A classic example of this with reference to the car driver domain can be seen in the 1963 film 'American Graffiti' where the behaviour of car driving is taken to the height of expressive activity but where, nevertheless, many practical tasks underpin the success of the expressive actions achieved.

There are a number of studies which illustrate the importance that car driving has in the lives of many young drivers and demonstrate that this goes beyond the practical elements of the driving activity. Harrington (1972), in a school based study, found that young drivers who were generally more emotionally involved in driving had higher accident records in the first four years of their driving career. Schuman *et al.* (1981) claimed that young males under 21 years used the car as an emotional outlet and reported that 'racing or taking dares' was prevalent amongst half of the 16-24 year old group compared to less than a fifth of the 21-24 year old group. Williams *et al.* (1984) found that 89% of students surveyed (N=46,906) agreed that *'having my car is very important to me'*. Firth and Geoffery (1980) showed that almost all 16-17 year olds wanted to own a car and that the car was viewed as a method of enhancing their status in relation to the opposite sex.

Previously, Pelz and Schuman (1968) had interviewed 452 youths aged 16 to 19 years of age. They identified that there were three factors associated with the dangerous driver; these were (i) give more attention to their vehicle (ii) drive more than 20 hours per week for fun and (iii) regard the vehicle as an essential factor in their lives. In addition, there was a linear increase in the number of traffic violations with the time spent on the care of the vehicle (eg repair and cleaning). Quenault (1967) also reported similar findings that young drivers (17-20 years) obtained greater pleasure from driving and from overtaking other cars and were more competitive on the road than older drivers (60-70 years). However, although the findings appear in line with other work in the field, the choice and comparison between these two (somewhat extreme) age ranges is of questionable value.

A rough guide to determine whether an activity is practical or expressive is to see whether the relation of means to ends is causal. Harre (1979) recognised the difficulty that the causal account of action can often be indirect and not obvious, but still remain linked. In addition, the end goal of an activity may not be easily determined or defined. Thus Harre (*op cit*) proposed the further distinction between physical and psychological (and social) causality. He continued that *'if an outcome of an action sequence is taken to be supportive of or demeaning to a reputation then the activity is to be treated as primarily expressive'* (1979, pp.20-21).

As mentioned above, the same action can be the result of different motives and similarly, the same action can be viewed in different ways. Different groups of people, often quite small 'local' groups, have different judgements upon which activities demand respect or contempt. To continue with the example, a speeding driver can be viewed with respect or contempt. Sometimes the social demands of the occasion overrule those individual feelings or attitudes. For the most part, however, much activity is 'ritual and ceremonial' and determines the activity in spite of the feelings and attitudes of the participants (Harre, 1979).

There are many social activities which can be viewed with respect or contempt by different groups of people. There are also more permanent attributes and properties of human beings that can be treated with respect or contempt, such as sex, accent, appearance, age, job, colour and so on. It is sometimes extremely difficult to determine what attributes are currently viewed with respect amongst different groups and almost impossible to predict. An example of this with many car drivers is the type of car that a person drives, with the extent of 'respect' or 'contempt' for different types of car varying with individuals or groups.

'Respect' and 'contempt' are linked to particular activities of daily life, including driving. They are vital to the continuation or cessation of any particular form of an activity. Respect is shown by deference and contempt by disdain. Respect, particularly from defined groups, is generally something to strive for, whilst contempt is something to be avoided. Marks of respect and contempt vary between groups.

The concepts of 'reputation', 'identity', and 'social worlds' are central to modern social psychological thinking. It is argued that all individuals acquire and maintain their identities or sense of self-worth and uniqueness, through the gaining of social reputations. These may be acquired through educational achievement, sporting prowess, occupational advancement, physical strength, and/or a range of other fields. Different groups within society at large place different emphasis on particular ways of acquiring reputations; groups with common criteria for evaluating social worthiness are referred to as 'social worlds'. Hence, basic demographic information about individuals is, of course, relevant up to a point, but does not provide much useful information regarding these more specific 'social worlds' which the individuals inhabit (Ingham, 1990).

To an extent, being a 'young person' is characterised by some common attributes; these include, for example, questioning, to a greater or lesser extent, the official sources of information and advice from their elders, a general tendency to underestimate risk in many domains, and so on. Within this general category of 'young people', however, there is a wide range of 'social worlds', each with characteristic criteria for the gaining of reputations. This point is well-illustrated by the constantly changing patterns relating to preferences for popular music, fashion, leisure pursuits, and so on (Hendry, 1981 and see Ingham 1986, 1987 for review of the increasing importance of leisure and lifestyle research).

It is important to emphasise that one individual can (and probably does) engage in many different over-lapping social groups and may occupy a different position, character or reputation within each group. The group, position in the group, activities and performance of these activities which are associated with respect or contempt determine to a large extent the behaviour of the individual. Individuals' conception of themselves may be at odds with those of the group(s). This creates tension which, in turn, can produce deliberately contrived social activity with the aim of altering the group's perception of the individual. This type of activity can be termed 'presentational activity'. It is important to realise that individuals may undertake activities without fully understanding why they undertake them.

Research and hypotheses discussed above suggest that there is some evidence that distal (non-immediate and non-driving) influences may influence car driving behaviour. The rest of the chapter concentrates on some of these issues concerned with young male car drivers. It will be examined whether young male drivers vary to the extent to which they interpret driving behaviour as a practical and/or expressive activity. Such an interpretation may be influenced and shaped by numerous influences, an important element of which might be the peer group to which they belong and the social norms which operate within the group and which determine the gaining of respect and status. Other possible influences on young male car driving are discussed below (Chapter 7).

6.2 Lifestyle

A fundamental part of any young person's lifestyle involves their leisure pursuits. Although it is customary to regard young people's leisure activities as identifiable within an age category it is evident that many different and contrasting leisure activities are covered by the drivers. The first analysis examined differences between participation in what we have termed primarily 'active' leisure (involving physical sports such as football, badminton, squash, running and so on) and participation primarily in 'passive' leisure activities (such as 'going out', music, cinema interests and so on). Whilst both 'safe' and 'unsafe' drivers participated a great deal in both 'active' and 'passive' leisure, a few recognisable patterns emerged. More of the 'safe' drivers participated in 'active' leisure involving traditional sports than the 'unsafe' drivers, but more of the 'unsafe' drivers (albeit a small number) either took part, or expressed a willingness to take part, in a number of activities involving (arguably) high risk-taking and thrill-seeking such as hang-gliding and off-road mountain biking. Many of the unsafe drivers also mentioned the participation or desire to take part in off-road driving (Chapter 7).

#3: If I could afford to I'd do a lot. Bit of motorcycling and drinking a fair bit. I'd like to do some hang gliding, but it costs too much. (Unsafe driver, 18 years)

#11: Basically I'm a boy who didn't grow up really! Abseiling, potholing, I do a lot of that sort of thing. (Unsafe driver, 19 years)

#13: I used to race mountain bikes, but I can't anymore, I'd be in a wheelchair if I carried on, both my knees are buggered up. When I had my bike I was extremely reckless... (Unsafe driver, 19 years)

#15: They were more the sort of dangerous sports, I used to do hang-gliding, caving, sub-aqua and mountain biking but I don't have time, recently I haven't taken any exercise...the only hobby I do is motorcycling for recreation because you can go damn fast. (Unsafe driver, 20 years)

The frequency of evening activities did not vary between the driver groups. The types of friends that the drivers associated with did reveal small differences. Slightly more of the 'safe' drivers (59%) had regular girlfriends/partners than the 'unsafe' drivers (48%). Inevitably the 'safe' drivers spent more of their evenings out in the company of their partner than male friends, whereas the 'unsafe' drivers tended to spend more evenings out with male friends than with partners.

Drivers with regular partners or in long standing relationships stated that they had matured or 'grown up'. Amongst those few drivers who were married or had fiancees there was a general acceptance of lifestyle changes which had affected much of their behaviour including car driving. In a similar way, drivers with financial burdens such as mortgages or debts tended to state that they had less money to spend on 'going out' or on cars and that such factors had, in turn, affected their driving behaviour and general attitude to cars.

For example:

#5: Maybe I've matured a lot in last 18 months, generally settled down. I've got a lot of responsibilities now with buying a place, I can't afford to be silly and smash up my car and pay for it... ...I go round with my girlfriend (fiancee) more, so I'm not out to impress my mates or anything...I don't (drive fast) because we have been going out a long time, so I don't need to show off so often. (Unsafe driver, 18 years)

#23: To begin with when you're young you want to enjoy life, it's finding fun, exhilaration, but as you get older, especially when you get kids, you start to get worried about safety and generally the enthusiasm dies off. (Unsafe driver, 23 years)

#45: I think I've taken a lot of big steps in my life, I've got quite a responsible job, in charge of a heck of a lot of money and a lot of responsibility with (company name) and generally we're expected to be one heck of an adult, it's hard to be an adult one minute and then get out and be a bloody young kid the next. (Safe driver, 21 years)

#49: Used to not bother, used to get maximum revs, but now I'm unemployed I am a fuel saving driver. (Safe driver, 22 years)

6.3 Peer and parental influence

Drivers were asked to rate how much, in general, they were influenced by their peer group and by their parents and how safely they rated the driving of their peer group and parents. A consistent pattern emerged; namely that the 'unsafe' drivers were <u>more</u> influenced by their peers' and their parents' behaviour than the 'safe' drivers, and that the 'unsafe' drivers estimated their peers' and parents' driving as <u>less</u> safe than did the 'safe' drivers. In sum, the 'unsafe' drivers were more influenced by, and more exposed to, 'unsafe' driving than the 'safe' drivers.

For example:

#6: Dad's driving wasn't really very good, after he taught me to drive he did the

advanced driving...but before then he didn't really know the rules of the road. (Unsafe driver, 18 years)

#27: My Dad's driving was so different from what I was getting taught that in the end he couldn't sit in with me when I was practising. He has poor anticipation and doesn't concentrate as much as he should. (Unsafe driver, 25 years)

Many of the drivers confirmed findings from the earlier study that it is only a minority of young male drivers that can be termed 'unsafe'. The effects of peer influence are examined in greater detail on specific topics (see Sections 5.3, 8.1 and 8.4).

For example:

#9: (-a driver highly influenced by his peers described their driving as) Crazy! But then they'd say the same about me. It's awful. I'm stamping my foot on the ground going 'slow down'. (Unsafe driver, 19 years).

#13: Some of them drive terribly...But the majority of my friends drive pretty safely. I know some people who come to school and say 'Oh I jumped a red light, screeched round a roundabout and wheel spinned away'... (Unsafe driver, 19 years)

#15: The majority are quite safe, but it's just the odd one or two...they think they're rally boys...they drive it like a lunatic. (Unsafe driver, 19 years)

#32: Most are quite safe, but there are one or two, one in particular, he's had God knows how many accidents...Nobody wants to go with him 'cos he's a liability; he definitely does it on purpose. He enjoys seeing us fret and tell him to stop. (Safe driver, 18 years)

6.4 Drinking behaviour

Drivers were asked about their drinking habits when they were and were not driving. 43% of all the drivers thought that they had driven whilst over the blood alcohol limit (BAC) at least once in their driving career. Although there were no marked differences between the 'unsafe' and 'safe' drivers, many of the explanations for their drinking and driving were revealing and reflected and supported other areas of their driving behaviour. For example, some drivers with regular partners claimed it was easier to organise their drinking because they could now share the driving responsibility with their partner. Very few of the drivers were deliberate drink-drivers who went out with the intention to drink over the BAC and then drive. Many of those who had driven over the BAC blamed lack of forward planning, an argument or being let down by friends as the reason for their subsequent driving after alcohol.

For example:
#2: Once I was going to stay at a friend's house and he didn't turn up at the party... (Unsafe driver, 18 years)
#7: Those circumstances when there is a mix-up and I'd go to the pub with my brother and I'd think he was driving and he'd think I was driving. (Unsafe driver, 18 years)
#20: Once, we went to a party, I was engaged; we had a big argument and I just left and got straight in the car. (Unsafe driver, 21 years)
#33: I've thought 'Oh shit!' I can't leave the car in this sort of area - about 2am so I thought I'll chance it... I thought I was going to get a lift with my mate and he left early. It's always been through lack of planning or someone getting a 'strop' and walking out early. (Safe driver, 19 years)
#43: Three of us went to a nightclub on a regular basis. One person got into a fight and the person that was sober steamed off and we were in a predicament, we were inebriated... (Safe driver, 21 years)
One of the problems expressed by the drivers was their lack of knowledge of the BAC limit in practical terms such as amount of pints, glasses of wine and so on. Their confusion over the limit created circumstances when they may have inadvertently driven over the limit. It has to be remembered that many young drivers are inexperienced drinkers as well as inexperienced drivers.

Some of the comments were:
#27: Sometimes its difficult to refuse drinks, also you think I'm going to be up

and about till 2am and so by the time 2 o'clock comes some of it's worn off, but then you think 'No, it hasn't worn off'. (Unsafe driver, 25 years)
#39: (at a function/party) You kind of lose track, I don't know what the limit is with wine - it's quite alcoholic and it's difficult to keep track, it fills up and you sit there all evening... (Safe driver, 20 years)
#45: I was just 18, we'd had a few Stellas (strong lagers) and when I got out into the fresh air it hit me a lot more than I thought. (Safe driver, 21 years)
#53: I try to keep it well under (the BAC limit), I work it out, how much time I'm going to spend there - I'd be happy if they bought out a new law which said anybody who drives can't drink anything. It would be a lot easier. (Safe driver, 25 years)

The amount of alcohol reportedly consumed by the two groups of drivers in a typical evening did not vary significantly with group. Slightly higher levels of drinking were reported by the 'safe' drivers than the 'unsafe' drivers, both when they were driving, and on the occasions when they were not. 65% of all the drivers consumed less than three units of alcohol on a 'typical' evening if they were driving. Three-quarters of all the drivers were non-smokers with again, little difference between the groups.

Typical comments from both groups of drivers were:
#11: One's the limit and we're quite happy with that, you can enjoy yourself without it. (Unsafe driver, 19 years)
#17: I don't drink and drive at all. I have on occasions bent cars and having proved I can do it totally sober I can feel it as soon as I have a drink, if I did anything to anybody else it might be at the back of my mind that maybe if I'd been sober... (Unsafe driver, 20 years)
#32: If I'm driving I generally don't drink anything but if I do then it's never more than one pint. (Safe driver, 18 years)
#55: If I'm driving I'd limit myself to one pint maximum and usually that's only something like a very low alcohol cider. (Safe driver, 17 years)

Peer support seemed to be a major factor influencing whether the drivers drove over the BAC limit. Drivers recognised that it was easier to refuse alcoholic drinks with peer support. The favourite strategy for avoiding drink driving was to take it in turns with friends to drive and not drink. Friends would, therefore, support each other's efforts knowing that next week it would be their turn.

Some of the comments were:
#6: I think I've got my friends well trained - I'm normally the chauffeur so they don't like me to get too drunk! (Unsafe driver, 18 years)
#8: We usually try and take it in turns to drive so the next night they'll be doing the same. (Unsafe driver, 18 years)
#13: We often take it in turns so responsibility shifts to other people. I know people who've been too pissed, what they decide to do is drive into town and leave their car there and they've tried to get in their car...I've stopped quite a few people like that. (Unsafe driver, 19 years)
#34: It's normally accepted that one person is going to drive and he's going to stay sober, so there's no real pressure. (Safe driver, 19 years)
#39: They don't encourage me not to drink 'cos if you're driving they just take it for granted. (Safe driver, 20 years)
#46: Friends think yeah OK you're driving, I don't feel any pressure like that (to drink). (Safe driver, 22 years)

Those few drivers whose friends did not support them stated how difficult it was to resist the offer of a drink. Although the drivers recognised the help they received from friends, they did not always openly express their disapproval to friends who did drink and drive and seemed to think their disapproval would be ignored.

For example:
#10: I know people who drink 8 pints of lager and drive still, but that's up to them isn't it? I can't do anything to stop them, I would if I could. (Unsafe driver, 19 years)

#31: There was a couple of boys who used to make a thing about getting pretty drunk and then going out. It was laughed at and we're not coming in your car...we wouldn't have a go and tell them not to do it, but secretly we'd say 'Oh God, they're being stupid'. (Safe driver, 18 years)
#33: Like me, they (friends) don't approve of it (drink driving) when they're sober, but when you're drunk your perspective changes a bit. (Safe driver, 19 years)

Another problem that the drivers mentioned was the lack of adequate public transport as an alternative to driving. This factor had led many of the drivers, if not to actually drink and drive themselves, to accept lifts off friends whom they knew to be intoxicated explaining that, under the circumstances, they had very little choice.

For example:
#5: I had to drive home; I could've caught a taxi but it wouldn't have been convenient to get to work the next morning. (Unsafe driver, 18 years)
#10: I intended to leave my car and get a taxi...it was raining and there were no taxis so I thought I would drive...I knew I had done wrong... (Unsafe driver, 19 years)
#37: I've been driven to a pub by someone else and they decide to drink, there's not a lot you can do about it, you've got to get home. (Safe driver, 20 years)

#53: Once my mate said he wouldn't drink, I got myself 'steamed' and I was more worried about walking home than getting in the car with him, but I wasn't too chuffed when I realised he was quite heavily 'pissed' up. (Safe driver, 25 years)

Some of the drivers who had known they were near, or over, the BAC limit in the past had tried to justify or limit the effects of their actions. The drivers forwarded some methods or techniques both to avoid being apprehended and to lessen the likelihood of causing an accident. The most common of these was to wait until it was extremely late at night and then drive home on very quiet backroads, often in the country.

Some of the typical comments were:

#21: ...I were smashed but it were dead late at night. ...(my mate) he knew he were over limit but it was a dead sleepy town. (Unsafe driver, 21 years)

#43: We went for a walk to get rid of some of the alcohol and wait for the roads to become more quiet, the chances of hitting a small child at 4 am is very rare indeed. (Safe driver, 21 years)

#53: I lived in the country and there was nothing between me and the pub except two miles of road and, on a bad night, a couple of cows...I pushed my luck a bit. (Safe driver, 25 years)

Although some of the drivers had driven whilst intoxicated in the past, many of the drivers felt that the situation was improving and that their age group was considerably better than older groups. Some of the drivers stated that the importance of the car in their lives ensured that they did not want to risk losing their licence.

For example:

#20: (Just after changing job) Now I think if I haven't got my car it's going to affect me quite a bit...it's a responsibility, I've gone through the phase now when it's just drink, drink, drink. (Unsafe driver, 21 years)

#32: People of our age have been brought up with drink driving, with your parents' age, when they were younger drink driving didn't come into it so they find it harder to turn a glass of wine down than we do. (Safe driver, 18 years)

#36: When I was 17, I was driving my father's car and he heavily pressured me to drive even though I had a drink - I was under the limit but I recognised a different personality. My friends have a genuine responsibility because they see their cars mean a lot to them, they've spent a reasonable amount of their income or effort in their cars...I wouldn't think other road users would figure first in their minds. (Safe driver, 20 years)

#54: I went to see my Dad in his office and he gave me a large whisky, about two doubles! I hadn't eaten all day and the police caught me and by that time I was just on the limit. (Safe driver, 19 years)

6.5 Driving as an expressive and/or practical activity.

Considerable differences emerged between the 'safe' and 'unsafe' drivers' general approach to cars and driving. Such differences were evident in the approach adopted by drivers before learning to drive (for example, the greater percentage of 'unsafe' drivers who drove illegally prior to obtaining their provisional licence). More of the 'unsafe' drivers were desperately keen to drive and could hardly wait till their 17th birthdays to learn to drive and pass their test as soon as possible; the 'safe' drivers however, although keen, were generally less enthusiastic.

Some typical comments from the 'unsafe' group were:
#5: My first lesson was on my 17th birthday. A lot more freedom but I just wanted to drive though. (Unsafe driver, 18 years)
#11: All my friends, as soon as we turned 17, had lessons and it was a great thing; we all passed first time, there was a lot of pressure to get your licence as soon as possible...you had to pass or else you could never forget it. I bought my car a couple of weeks before I passed my test... ever since I was 6 I'd always wanted my own car. (Unsafe driver, 19 years)
#21: ...you've got to learn to drive it's like not being able to walk. (Unsafe driver, 21 years)
#29: I couldn't wait to pass, I had a lesson on my 17th birthday. (Unsafe driver, 23 years)

Some typical comments from the 'safe' group were:
#30: Independence, not having to rely on other people so much and being able to give back a little of what you've taken away for 18 years; it's nice to drive the rest of the family if they want a drink. (Safe driver, 17 years)

#38: Freedom...earning potential, a lot of jobs involve you having to drive sometime... (Safe driver, 20 years)
#54: My home address is very rural, the only transport is cars, no buses or trains...so you've got to have a car. (Safe driver, 19 years)
#55: ...it meant not having to take the bus into town anymore. (Safe driver, 17 years)

A subtle, but important, difference emerged between the 'safe' and 'unsafe' drivers as to the purpose of driving. Whilst both groups of drivers mentioned the considerable practical benefits of driving ensuring individual mobility, independence and freedom of movement, for the 'unsafe' drivers car driving also meant much more. Driving was often viewed as an end in itself, rather than a means to an end. Driving was seen as a method of enjoyment. In sum, many 'unsafe' drivers recognised the practical side of driving but also enjoyed and viewed driving, to a considerable extent, as an expressive activity. 'Safe' drivers acknowledged driving as an extremely useful practical skill but they did not attach the same over-riding importance to it that 'unsafe' drivers did, and did not view driving as an expressive activity to the same degree.

'Unsafe' drivers more often emphasised the feeling of enjoyment that they got from driving; the feeling of freedom, power, satisfaction and their sheer love of driving. More of the 'unsafe' drivers often used to go out in the car for a drive for no reason beyond the fact that they wanted to go out for the joy of driving around. Most frequently such journeys would involve drives out to the country where there was less traffic and where they could undertake riskier driving practices with less fear of being caught by the police. Often drivers stated that they loved driving but found it difficult to express what it was that they loved about it. More of the 'safe' drivers emphasised the practical benefits of driving rather than the act itself and those that did enjoy driving tended to enjoy 'everyday', 'safe' driving and take a pride in their 'normal' driving behaviour, rather than risky driving practices.

Some examples from the 'unsafe' driver group included:

#2: I used to just go out for a drive. I like going down country roads to see how fast I could go. Down country roads or town centres late at night. You'd have the windows down and the music on loud, it's who you're looking at. You might see people you know. (Unsafe driver, 18 years)

#3: My mind has never been so clear as when I'm driving fast, one can't see anything else in the world... it's perfect. (Unsafe driver, 18 years)

#4: I love driving, driving is what I do. I've been into it ever since, I inherited it from my Dad. My Dad and Mum love driving, I've always loved it, loved being in a car. I don't know why. I like the feeling of it. (Unsafe driver, 18 years)

#5: I love it, one of the best things that has ever happened to me. The feeling of overtaking someone and you can look at them in the mirror as you've shot past them - I found it fun, a bit scary I suppose to shoot along the road real fast, not knowing whether if someone came along you'd stop or anything; it was a thrill I suppose. (Unsafe driver, 18 years)

#9: I love it, it's great, one of the best sort of fun things to do. I love it more than doing anything. It's a toy, you know, it's everything. I'd be lost without it. If I lost my licence I don't know what I'd do. There's not a day goes by that we're not in it... You're driving around, you're in control on your own, you do what you want. (Unsafe driver, 19 years)

#11: Living at home, it suddenly gives you independence, the world's your oyster and you do it to impress not only girls, but your other mates as well. (Unsafe driver, 19 years)

Some examples from the 'safe' driver group included:

#48: I've always enjoyed it looking out for anything and everything, little clues on the road, maybe find something round the corner, I'm proud of my qualifications. (Safe driver, 22 years)

#49: I get a sense of fulfilment because I take an extra bit of effort and I've done a little bit more driving skills; I'm more confident than other drivers and I can point out situations to passengers and then it happens and I can say 'I told you so', it's nice to be in that position. (Safe driver, 21 years)

#56: I enjoy feeling that I'm driving the car confidently. (Safe driver, 25 years)

Drivers were asked if the car was more than just a means of transport. Both groups of drivers stated that, in general, the car was often viewed as a status symbol. More of the 'safe' drivers, however, stated that the car was primarily a means of transport to get from A to B. Some of the 'unsafe' drivers also forwarded this argument, but more frequently came up with ways in which the car was more than merely a method of transport.

Some of the 'unsafe' drivers reported:
#4: It's my piece of artwork, it echoes me, well it hasn't yet but I'm working on it at the moment, building it up, I've got a goal and a list of things that need to be done, it's going to be the machine it should be. At the moment it doesn't look how it will when it's finished at all - the wheels will be different, I'll have a respray, I always look forward to that. I've put a lot of work into it. It's great to drive, it's like a creation of mine. It's so incredibly sentimental and I've done so much to it that if somebody insults it, it's like insulting a person and I'm going to prove them wrong about that... (Unsafe driver, 18 years)
#6: It's a friend really. You'd feel guilty if you sold it, when you took it to a scrapyard - it's part of you, isn't it? You get attached to them... (Unsafe driver, 18 years)
#8: Yes, I think the (VW) Beetle has got a certain character of its own and when you see other Beetle drivers everyone waves. My Dad has got a Rover and even though it's nicer inside and stuff, it's more just a kind of car. (Unsafe driver, 18 years)
#15: Definitely, if it was just a means of transport we'd all be driving Skodas or Ladas. (Unsafe driver, 20 years)

Some of the 'safe' drivers reported:
#32: Principally it's a means of transport, but then it might come in as slightly a status symbol, it has prestige to have one at a young age. (Safe driver, 18 years)
#34: It's more a status symbol than a means of transport. People seem to spend

a disproportionate amount of their money on a car; I've never understood why. (Safe driver, 19 years)

#49: The car is a murder weapon. Just shut your eyes for three minutes and you stand a chance of killing someone. (Safe driver, 21 years)

#51: It's a means of transport to an extent but it's sort of got an image, part of your image. (Safe driver, 23 years)

#52: My attitude to my car is that it is a work-horse... (Safe driver, 24 years)

#53: It's all to get from A to B. When I was younger my car wasn't all that good looking but it could have been a bit of a 'girlie attracter'. (Safe driver, 25 years)

As many as three quarters of all the drivers interviewed admitted that they had raced on the road. However, more of the 'unsafe' drivers (86%) had participated in races on public roads than 'safe' drivers (63%). The forms of racing varied from the taking of an alternative route to get to a destination quicker to competitive racing one against another.

Some of the 'unsafe' drivers commented:

#9: I've done it a few times on the motorway, they'll overtake you and you think, 'I'm not having this' and you'll overtake them and they'll do the same. I hate losing, that's why I want a bigger car I'll have them easy then! (Unsafe driver, 19 years)

#14: (Raced) quite a few times, normally work colleagues, you meet on the motorway, you just push it up a little bit, they push it up and you see who's got the most bottle... (Unsafe driver, 20 years)

#15: Sometimes (race) if the guy is driving something that looks stupid. If it's something like a guy in a 'boy-racer', in a done up Escort 1.3, Mark II series, I'll blow him out; yeah, I'll take him out. (Unsafe driver, 20 years)

#17: It tends to get sort of who gets there first, not exactly racing on the public highway but none the less... (at lights) it depends, if I'm sort of feeling that nature, then I sit there casual and then go and hopefully leave them behind, it's quite satisfying. If it's something with potential then 'Oh this could be interesting',

if it was a Mark III Cortina with wide wheels and furry dice I'd probably ignore it and it'd go away. (Unsafe driver, 20 years)

#29: ...it took me an hour and a half to get there and I was really determined to get back in one hour 15 minutes and I really went for it. (Unsafe driver, 23 years)

Some of the 'safe' drivers commented:

#34: There have been times when there's two of you driving, one's following the other and you'll go a bit faster to see if they keep up, but not side by side racing. (Safe driver, 19 years)

#36: Maybe a couple of times from the traffic lights, but only from - I was going to say childish - an amateur point of view... just for the first, say 30 or 40 feet. (Safe driver, 20 years)

#43: I've had a couple of 'Jack-the-lads' in their XR3i and in the Volvo I leave them standing for 100 yards and then if they want to go past me they can. (Safe driver, 21 years)

#46: As far as a race, one on one is concerned, it's just too bloody dangerous. There have been times when people have gone different routes, it's not a race but you hope to get there before them. Safe driver, 22 years)

There were no clear differences between the different groups of drivers in relation to their interest in motor sport. Some drivers in both the 'unsafe' and 'safe' groups loved to watch motor sport and go to 'meets', whilst others hated it. Some drivers who liked to watch motor sport wanted to have a 'go' at it as did some of the drivers who hated it! As one driver stated: *#3: It's as boring as hell to watch, but I'd love to do it. I occasionally watch it, it's fun watching the crashes! (Unsafe driver, 18 years).*

6.6 Car culture

'Unsafe' drivers were generally more enthusiastic about driving, more knowledgeable about car types, makes and models, about how cars work and were more likely to be able to fix them on their own than 'safe' drivers. Many more of the 'unsafe' drivers maintained their own cars, not just because it was cost effective but because they enjoyed it and treated car maintenance as a hobby. 'Safe' drivers seemed to be less interested and many of those who had once been very involved in a 'car culture' expressed less and less interest.

Some 'unsafe' drivers comments were:

#3: I've had the engine out once. I'd like to re-build one and do whatever to... (Unsafe driver, 18 years)

#6: A lot of the time. I rebuilt the engine two months ago because I blew that one up. (Unsafe driver, 18 years)

#9: I always want the quickest one, adding bits to it; stereo, tyres, wheels, changing bits on it, getting it tuned up, I enjoyed doing it up in the evenings, I can do most things. It may take five times longer than a garage, but I enjoy it. (Unsafe driver, 19 years)

#14: My favourite car was a complete wreck, but it was so brilliant, so much fun, if it broke down, I'd fix it; if someone crashed into it I'd say 'don't worry mate, I'll pull the dent out, you just give me a tenner for a can of spray paint' - Brilliant! (Unsafe driver, 20 years)

Some 'safe' driver comments were:

#31: Not really (interested), I can probably change a wheel. (Safe driver, 18 years)

#32: I don't know anything about cars, I take it to the garage. (Safe driver, 18 years)

#36: I do the necessities like checking the oil, it isn't an area that particularly interests me. (Safe driver, 20 years)

#45: I haven't got a clue. (Safe driver, 21 years)

In general, 'unsafe' drivers tended to talk to friends more about cars and driving than 'safe' drivers. This finding was perhaps predictable since viewing a car simply as a method of transport with practical aspects paramount is likely to provoke less discussion than when cars and driving are treated as a hobby or form of entertainment. The 'safe' group of drivers did talk about cars and driving, but not to the same extent as the 'unsafe' drivers.

Some of the 'unsafe' drivers when asked how much they talked about cars and driving commented:

#3: Yes, generally our own driving, different techniques and stuff, 'toe-heeling' etc, we used to have loads of discussions about, different ways of accelerating very, very fast indeed. (Unsafe driver, 18 years)

#5: Alot, what we'd like, what they're getting- I saw a 'blah, blah' car the other day; I like looking at cars of different sorts and dreaming what I could have. (Unsafe driver, 18 years)

#8: Probably about the cars themselves and other cars, I've got a Beetle and my girlfriend's got one and her brother has one and he's really into it, I talk about it with him a lot. (Unsafe driver, 18 years)

#9: Down the pub, at work, like 'Oh, I saw a great car today' and you get magazines and read them and talk about your own car and 'Oh, I put this on it and it goes much quicker, or I changed these bits'...it's much better having a conversation about a car! (Unsafe driver, 19 years)

#15: It's more 'Oh shit, my car' and 'yeah, I went so fast today' and 'Oh, you wouldn't believe this asshole, I took out this guy in a Mercedes or something like that'...and also 'Oh, I want to get this car' or 'I like this car...' (Unsafe driver, 20 years)

In contrast, more of the 'safe' drivers commented:

#30: Not too much, we talk about it sometimes if someone is buying a car, but only if there is something specific to talk about. (Safe driver, 17 years)

#32: It's gone down, it used to be quite high, when you were taking your test it was quite a topic; pass, fail; ha, ha, but at the moment you still talk about it, but not in such great detail... (Safe driver, 18 years)

#52: Hardly (talk about cars) at all, only when they go wrong. (Safe driver, 24 years)

As the drivers felt they had become safer their attitudes to cars and driving had changed, and some of the drivers (both 'safe' and 'unsafe') volunteered that the car now meant less to them than it formerly did.

Some typical comments from the 'unsafe' drivers were:
#21: When I first started driving I were a bit of a 'boy racer', a bit of a 'twat'. Just you're King of the Road when you first drive aren't you? It's like a new toy, you want to see how fast you can go...see how far you can take yourself before you bottle out... (Unsafe driver, 21 years)
#28: ...I've got used to it, it's worn off and use the car as a convenience. (Unsafe driver, 18 years)
#29: I think everyone goes through a stage when they've got wheels and they go a bit mad. (Unsafe driver, 23 years)

Some of the 'safe' drivers commented:
#33: I had a lot to prove, I had no self-confidence, I couldn't go out and chat girls up if you will and I always thought I had to get a flashy car...A car, it's an ego boost really, but now I'm thinking of getting a car to get me from A to B...I've learnt from experience and mistakes, until it happens you don't know what it's going to be like, I don't want to go through the hassle of climbing out of a wrecked car and thinking about telling my parents. (Safe driver, 19 years)
#36: I try to think of the car as a means of getting from A to B rather than a means of entertainment and social status which sadly, I think, is not what everyone does these days. (Safe driver, 20 years) #41: A couple of years ago it would have been an aid to being successful with the opposite sex. (Safe driver, 21 years)

In sum, cars and driving appeared to play a more important and prominent part in the 'expressive' lives of the 'unsafe' drivers than they did for the 'safe' drivers.

6.7 Media

The effects of the media on many types of behaviour have been the subject of much psychological study. Most commonly, the effects of sex and violence portrayed on television have been examined (Berkowitz, 1962; Marsh and Campbell, 1982). Some researchers have argued that a consistent relation between television violence viewing and subsequent aggressive behaviour on the part of the viewer has been shown. It is argued that the media and specifically television and films, are influential socialising agents which can affect many types of behaviour on the part of the viewer. Television executives and advertisers must have been aware of these effects for a long time. However, many of these individuals have, at the same time, consistently denied a link between television and film viewing and antisocial behaviour, although they have never denied an effect on prosocial behaviour (Eron and Huesmann, 1986). However, it is accepted that the relationship is not necessarily a powerful one and does not have the same effect on everyone. Other researchers have argued that the causal direction is difficult to determine (Gunter, 1985).

Recently, attention has begun to be paid to the possible effects that the media (films, television and newspaper coverage) have on car driving behaviour in general, or in more specific instances like the recent media attention paid to so-called 'TWOCcers' (Taking WithOut Consent of the owner). For a number of years RoSPA (Royal Society for the Prevention of Accidents) has led a campaign to ban car advertisements which emphasise excessive speed, or use other invitations to transgress the Highway Code, in order to boost sales. Despite such attempts, many advertisers continue to emphasis speed at the expense of safety. This continues to occur because primary responsibility for the observance of The British Code of Advertising Practice (1985) remains with the advertiser. One of the problems with this whole topic is that very little is known as to the effects, if any, of such a portrayal. Preliminary work in the USA into the way motorbikes (particularly 'racing' types) are advertised suggests some relationship between advertising practices and subsequent crash involvement, although the link may remain tenuous (Kraus and Anderson, 1991).

A study by Visser (1983) examined the possible effects of auto races and motor races on the driving behaviour of visitors to such events with particular emphasis on their return journeys. No significant modification of behaviour was shown although it was demonstrated that younger drivers were comparatively more influenced than older drivers.

Evans (1990), reviewing some potential gains in traffic safety, stated that the largest potential gain can be achieved by encouraging and stimulating changes in the social norms relating to driving in directions more conducive to safety, and away from directions which are inimical to safety. To this end, Evans (*op cit*) stated that some research should examine the *'the effect of fictional television and movie portrayals of the life-threatening use of motor vehicles as heroic or humorous'* (pp.58-59).

A small part of this present research examined the reported ways in which media representations are or are not linked to young drivers' perceptions of, and actual, driving behaviour.

A range of topics concerned with the media were discussed including how the car is portrayed generally, whether this portrayal affects behaviour in general and/or in their own case, what the drivers thought of car advertisements and to what extent these determined the status of particular cars. Drivers were also asked whether the image of a car was important, if there were any cars that they would not wish to drive and which type of car they thought was particularly safe. In addition, drivers were asked whether they would drive in a different driving style, if they were given a different car (e.g. a faster, sports car). Some of the more revealing findings are outlined below.

Both groups of drivers felt that the car was portrayed in a very unrealistic light by the media. The car was portrayed as more than just a practical means of transport. The vast majority of the drivers stated that the portrayal was often ridiculous, exaggerated and far fetched. Indeed, only 7% of the drivers felt that media coverage of the car and driving was realistic and reasonable. Some of the drivers emphasised the portrayal of fast driving as a male orientated, somehow heroic activity in certain films and television programmes.

For example:
#7: The hero drives a fast car in films so it is a boyhood dream to have a 'posh' car and drive really fast. (Unsafe driver, 18 years)
#9: The films we watch , it's great, that's sort of 'racing' films or 'police' films, they're sort of driving along nice and fast. (Unsafe driver, 19 years)
#18: Pop songs and women encourage you to buy, like any other product. (Unsafe driver, 20 years)
#27: Far too idealistic, it's ridiculous...it makes people think they're invincible, they can put a seat belt on and they'll be alright. When you see a car roll over in a film and people get up and walk away, I was surprised because people I know who have rolled cars have broken arms and legs and that. (Unsafe driver, 25 years)

Some typical comments from the 'safe' drivers were:
#31: They're made out to be really glamorous, on the telly they're not really used as a means of transport, a lot of the time they're made out to be more than that, a status symbol or something. (Safe driver, 18 years)
#43: They portray it as a racing object more than as a safe and sensible thing. (Safe driver, 21 years)
#46: I guess a lot of the films don't help much as far as safe driving is concerned with the car crashes, people getting away with it without much difficulty. (Safe driver, 22 years)
#49: All they're worried about is the top speed. If car manufacturers were worried about people breaking the law they'd invent an engine where the top speed

would be 70 mile/h, and if they were worried about fuel economy they'd invent an engine that could run for 100 miles per gallon. (Safe driver, 21 years)
#51: Generally shows people hacking back and forth not setting a very good example. (Safe driver, 23 years)

Most of the drivers from both groups stated that the media presentation of the car may have some effect on driving behaviour in general, but only a very small influence, if any, on their own driving behaviour. Some drivers felt that media presentation of the car and driving was no different to any other aspect portrayed as fiction by the media and that it therefore did not, and should not, influence them. A few other drivers stated that they thought there was inevitably some subtle influence.

For example:
#2: There's quite a few films with car action chases...there is a certain appeal and you do emulate it in a way, but not directly. (Unsafe driver, 18 years)
#7: You can't help being influenced by it, everything in life influences you whether it's subconscious or not... (Unsafe driver, 18 years)
#9: When I'm watching races and that, you think 'Oh I'd love to do that' and you've got to get out, even if it's just on a roundabout here. (Unsafe driver, 19 years)

Typically, the 'safe' drivers reported:
#34: I make a conscious effort not to be affected by it but I don't think you can help it to a small extent. (Safe driver, 19 years)
#46: I'm hopefully old enough to know it's bollocks, but even so, where do you get your idea to do your first handbrake turn? (Safe driver, 22 years)
#52: The media probably had some effect on the fact that I always wanted a car as soon as I could ... (Safe driver, 24 years)
#54: If someone thinks they've got a car with a good 0-60 time then they're going to want to try it out, aren't they? (Safe driver, 19 years)

A few respondents recognised recent efforts to stress environmental considerations, but with limited effect! For example: *#11: When I was younger it used to be geared to fast cars, the image of the nice girl next to the bloke. I think within the last two years the 'ads' have gone 'green'... Overall it's important for the world to have nice, 'green' cars, but unfortunately I'd rather go for something with a big engine... (Unsafe driver, 19 years).*

Although it is extremely difficult to gauge directly what influence media coverage may have on young car driver behaviour, it would appear that any influence, if it does exist, is likely to be an adverse effect.

6.8 Discussion

It is apparent that there are a number of distal social influences which have some effect on young male car driving behaviour.

Earlier (Chapter 4), when the sample characteristics of drivers who took part in Study II were examined, no obvious differences emerged between the 'safe' and 'unsafe' drivers concerning socio-economic groupings or educational attainment. Such results do not provide support for studies which did find differences between these variables and accident involvement levels (McGuire, 1971; McMurray, 1970; Peck, McBride and Coppin, 1971). However, the design of Study II would not favour the replication of such findings since the in-depth methodology is likely to be of more relevance and more authoritative when dealing with in-depth issues rather than so-called 'hard' or 'fixed' characteristics of drivers.

The suggestion that more of the 'unsafe' drivers would like to participate in high risk (sports) activities provides some limited support that risky driving may be just one part of a larger risk-taking behavioural tendency amongst 'unsafe' young male drivers. This echoes the Problem Behaviour Theory put forward by Jessor (1987) where risky driving is incorporated within the theory. However, as Beirness and Simpson (1988) point out actual participation (rather than merely a desire to participate) in high risk leisure pursuits may enable these people to express their risk taking tendencies in other ways.

There was no evidence that higher alcohol consumption or greater numbers of smokers were present in the 'unsafe' driver group which contrasts with other studies (Harrington, 1972; Schuman and Pelz, 1972; Swisher, 1988). Again, a wider and more comprehensive sample of drivers should be used to determine such factors, concentrating specifically on the leisure area. It was beyond the scope of the present study to examine this area in greater detail, but it may be important to understand the contribution of leisure and lifestyle factors in the over-representation of young males in car driver accidents. For example, the development of 'high excitement' leisure activities prior to driver licensing age could be worth investigating. Similarly, there may be merit in exploring the link, if any, between the decline in sports participation after leaving school (where it is organised) (Hendry, 1981) which tends to coincide with the start of the 'typical' driving career. Findings which are more amenable to the methodology used in this study are the social dimensions of driving including lifestyle, parental, group and peer pressures.

Greater numbers of the 'safe' drivers had regular partners and spent more evenings in the company of these partners than the 'unsafe' drivers. Given the findings of Waller (1970) that single young drivers have higher accident rates than married drivers, this might be expected, especially taking into account the results from Study I, and also Section 7.2, concerning different effects of passengers. Indeed, Parker *et al.*, (1992) also show that the driver's partner may be an important influencer on the formation of young drivers' normative beliefs and suggest that highlighting the disapproval of partners in campaigns directed at 'unsafe' young drivers might be worthwhile. Our findings confirm that partner disapproval does appear to result in safer driving practices and therefore such an approach might prove effective, particularly since the 'unsafe' young drivers themselves may not recognise that driving campaigns are specifically directed at them.

Such results show that the concept of maturation and lifestyle changes may be as important and influential as the age variable in explaining male driving behaviour and that further work in this area might be warranted. Pierce (1977; cited in Rothe, 1989) stated that maturation and driving experience contribute to reduced accident rates amongst young drivers. Indeed, age is often used as a surrogate measure of maturation since it is easier to measure. Obviously age cannot be altered (unfortunately!) but the processes involved in maturation may be influenceable.

'Unsafe' drivers appeared to be more influenced by the less safe driving behaviour of their parents and peers than the 'safe' drivers were. This provides support that parental factors can influence childrens' driving behaviour and possibly, in turn, their accident records (McGuire, 1971). This is a revealing finding in that it suggests that parents have a responsibility to set a 'safe' driving example to their children <u>prior</u> to the age at which they learn to drive. Such a finding is important because it enables parents to take a constructive and practical approach to the issue.

It would appear that some drivers' 'risky' or 'unsafe' driving either gains or appears to gain (in their own eyes) some kind of social status amongst their peers, which was also shown by Clark and Prolisko (1979). Some of these young drivers, although they described their peers' driving behaviour as reckless, stupid or crazy, nevertheless reported driving in a similar manner because they perceived prestige, self esteem or some positive characteristic to be associated with that particular driving style. Therefore, risky driving behaviour by some young males can be understood as a deliberate form of 'impression management', whereby the impression that they wish to convey to their peers is one of a risky (but highly skilled) driver. One driver (rated very 'unsafe') stated that he enjoyed being thought of amongst his friends as a slightly wild driver!

The interview material obtained in both studies provided evidence of the importance of driving style for reputations and identities. Amongst the young male drivers in particular, reference was made to the ways in which 'rewards' (satisfaction and enjoyment) were obtained by driving in a risky manner, and thereby demonstrating prowess and 'skill'. It is of interest that the criteria of what constitutes 'good' driving varied between the different relevant 'social worlds' (Section 5.2 and 5.3). Whereas for some of the young drivers it was regarded in terms of safety and comfort (especially when passengers were present), for other drivers it was regarded more in terms of being able to 'handle' a car at relatively high speed. An important point to note in this type of analysis is that other people do not actually need to be present for these considerations to be important. Thus, styles of driving, even when alone, reflect individual identities which are, to a large extent, shaped by social presences.

Three quarters of all the drivers had participated in some form of racing on the road, a higher proportion than that reported by Schuman *et al.* (1981) in the USA. Baxter *et al.* (1990) refer to a passenger as the 'guest in the machine' and report on different passenger effects. Some of the 'unsafe' young drivers report that they drive in a faster manner as though passengers were present even when they are driving alone. This is because certain driving journey times that are taken to get to particular destinations can then be reported to their peers, as well as any other of their exploits on the road which they consider may increase their status as drivers amongst their peer group. In this way, it may be possible to talk about the 'ghost in the machine' referring to a passenger presence effect where no passenger is present (see also Section 7.2).

The interviews with some of the more mature drivers reflected the changing patterns of social worlds. As individuals move from peer group influences towards traditional family or partner contexts, so the criteria of 'good' driving altered. Quite frequent acknowledgements were made by the more mature drivers of the changes they had experienced in their driving, towards a more 'safe' and responsible style.

Over the last few years it has become apparent amongst road safety practitioners and the police alike that the drink driving problem is becoming less of a problem for young male drivers when compared to slightly older male drivers (Lennox and Quimby, 1990). This study supports such a trend with the majority of the young male drivers reporting apparently genuine condemnation for drink drivers. Nevertheless, some young male drivers still do, on occasion, drink and drive. The work shows that many instances where young drivers do drink and drive can be explained in terms of a rational sequence of events. Many of the instances where young males drove whilst over the BAC limit were due to lack of advance planning and not as a result of a deliberate premeditated plan to drink and drive. This has important implications for the way that drink driving behaviour is discouraged through media campaigns (Chapter 8).

Peer support was also an important influence on whether the young drivers drove over the BAC limit or not. This finding emphasises the positive benefit of peer support. It is generally reported that drivers susceptible to peer influence are most likely to have higher accident involvement levels (Clark, 1976; Clark and Prolisko, 1979; Firth and Geoffery, 1980), but it is evident that peer influence can also have a positive aspect. Thus, drivers whose peers supported their efforts at not drinking when driving found it easier not to drink and drive. The strategy of sharing the driving task amongst one's peers made it more likely that peer support would be forthcoming since next time it would be the turn of someone else to drive and then they would want to be able to count on their support. Thus, drivers who are readily susceptible to peer influence are likely to be safer drivers, <u>if</u> their peers favour safe driving as a positive behaviour (see also Section 7.1.2.2). Simple strategies like this which concentrate on peer influence might prove extremely effective in helping to reduce the problem for some drink drivers. It is also apparent that individuals do not appreciate the influence that they can have on other peer behaviour. Drivers admitted that their peers influenced their own behaviour but questioned to what extent their views would influence others. It appears likely that targeting all youngsters in information campaigns (ie peer groups) as well as drivers may make them potent additional agents of behavioural change.

Methods which were reported by young drivers to avoid or limit the effects of their drink driving actions, such as driving home very late at night on quiet backstreets or country roads, ties in with the common characteristics of young driver single vehicle accidents described by McKenna (1987).

Earlier studies have shown a link between a greater general interest and enjoyment in cars *per se* and higher accident and violation rates amongst young drivers (Harrington, 1972; Pelz and Schuman, 1971). However, this study has examined these issues in greater detail and has borrowed the distinction between expressive and practical activities devised by Harre *et al.* (1985) and adapted it to describe the different car driving behaviour of young male drivers. The distinction has been shown to be useful and applicable to 'safe' and 'unsafe' driver groups. Both the 'unsafe' and 'safe' driver groups regarded driving as a practical activity but for more of the 'unsafe' drivers, driving was also seen as an expressive activity. For more of the 'unsafe' drivers driving was sometimes viewed as an end in itself rather than a means to an end. Unfortunately, the enjoyment of driving as an expressive activity often involved risky and illegal driving manoeuvres.

From the limited data available there would appear to be no clear link between interest in motor sport and particular driving practices which supports the work by Visser (1983), although this topic requires further more detailed investigation before any real conclusions can be drawn.

93% of the drivers viewed media presentation of the car and driving as unrealistic and unreasonable. Evidence from the current study suggests that any media influence on car driving behaviour, if it does exist, is likely to be of an adverse nature. Evans' (1990) plea for further research into the possible effect of television and movie portrayals of the life threatening use of motor vehicles would appear to be supported in the light of the present preliminary work.

7 PROXIMAL SOCIAL INFLUENCES ON DRIVING

7.1 Introduction

The study of the social context of driving is essential in order to attain a comprehensive understanding of car driver behaviour. Some of the more distal social influences have been examined in the preceding chapter. There are also a number of more immediate social influences on car driving behaviour which take place either within the car or in the immediate vicinity of the car and which have been termed the proximal (micro-environmental) social influences.

The effects of passenger presence are becoming increasingly recognised and documented. However, there is still disagreement as to the psychological theory which might best explain all the passenger effects evidenced. A number of these theories will be briefly discussed in the light of previous work and findings from this study.

There are also a number of other proximal social influences which, as yet, have not been the topic of much traffic research but which may nevertheless, be important factors in car driving behaviour; these include radio cassette use, mood effects and the effects of other drivers' actions.

7.1.2 Social facilitation

7.1.2.1 Background

The idea that the presence or absence of spectators has an influence on a given task or behaviour has a long tradition in social psychology (Triplett, 1897; Travis, 1925). Such studies generally showed that subjects' performance in the presence of an audience surpassed their performance whilst working alone; but the difference between the best scores was not that great.

Bergum and Lehr (1963) obtained an increase in performance under experimental conditions which involved National Guard trainees watching lamps being lit in a set sequence. During each hour of activity there would be 24 lights that were not lit in the correct sequence and the subject's task was to press a button whenever this occurred. The subjects were given sufficient training to learn the task. Whilst subjects were subsequently performing the task, some of the subjects were visited by a superior officer who observed the subjects working on the task. Results showed that whilst the performance of both groups (the 'alone' and the 'visited' groups) declined over time due to fatigue, the detection and accuracy of the 'visited' subjects remained, on average, 34% higher than the accuracy of the trainees working alone and that during the last time interval it was twice that of the subjects working alone.

However, the presence of an audience does not always lead to an improvement in performance on a task. Husband (1931) demonstrated that subject's learning performance at a finger maze was impaired if an audience was present. Similarly, Pessin (1933) had 60 subjects learn three lists of seven nonsense syllables. Some of the subjects learnt the list whilst alone and the other subjects learnt it in the presence of spectators. With the spectators present, the subjects required an average of 11.27 repetitions to learn the seven syllable list, whilst the 'alone' group needed only 9.85 repetitions. Thus it was concluded that some tasks are facilitated and others are impaired by the presence of spectators.

It can be seen that the different effects of an audience are dependent on the particular task being performed. It would appear that the presence of an audience impairs the acquisition of new responses and facilitates the emission of well-learnt responses. Put simply, the presence of an audience impairs learning but facilitates performance of a learnt task or behaviour.

This was explained by Zajonc (1966) who proposed that during the early stages of learning a subject gives a greater number of wrong responses than correct ones and therefore the wrong responses tend to predominate. But once an individual has successfully learnt a task their behaviour is dominated by correct responses. Thus, the original observation could be reformulated as follows: audience presence enhances the emission of the dominant responses for any given situation. During learning, the dominant responses are incorrect responses and it therefore follows that the performance is impaired by the presence of an audience; but during performance of a previously learnt task, the dominant responses are correct responses and thus the presence of an audience enhances these responses leading to the facilitation of the performance.

Despite the fact that it has been demonstrated that there are different effects that the presence of an audience can have on a particular task, the term 'social facilitation' coined by Allport (1924) is often used in the psychological literature regardless of whether the performance of the task is facilitated or impaired by the audience presence.

There are several theories to explain how these social facilitation effects occur. One theory is that the presence of spectators alters the drive state of an individual who is performing a task. Triplett (1897) adopted this drive based theory of social facilitation by suggesting that spectator presence enabled the release of reserves of 'nervous energy' which could not be released in other ways and led to increased energy or heightened drive which enabled the cyclists in his experiment to cycle faster.

In many ways, this is similar to Zajonc's theory of social facilitation (Zajonc, 1965). However, Zajonc (*op cit*) took it a stage further by arguing that the presence of an audience enhances the emission of dominant responses. A drive based theory of social facilitation has also been forwarded by Cottrell (1968, 1972) and Sanders and Baron (1975), although there is disagreement as to whether the presence of spectators on their own produces the increase in dominant responses or whether there are other factors involved. Cottrell (1972) suggested that social facilitation occurs when an individual performing a task believes that the audience will evaluate their performance and that this evaluation is arousing and results in the enhancement of the dominant responses. It follows from this that a person's performance at driving a car would not be facilitated if the driver believed that the car passengers were not evaluating the driving. It might be added that a person's performance on a given task will only be facilitated when an individual believes that the audience will evaluate their performance and when the individual believes that this evaluation by the audience (whether real or not) is sufficiently important to merit consideration. That is, an individual who is performing a task whilst being watched by someone who the individual does not regard as a 'significant other' (to borrow Fishbein and Ajzen's term), may not find their performance being facilitated.

Sanders and Baron (1975) suggested that audience presence has the effect of distracting a person from performance of a task. The most obvious effect of distraction upon task performance would appear to be that by decreasing the amount of time and/or attention spent on the task, the more the performance would be impaired. However, Sanders and Baron argued that there are theoretical and empirical grounds for disputing this view. Allport (1924) mentioned that the reaction to distraction is an increase in motivation caused by adopting an attitude of overcompensation that sometimes leads to accomplishing more than would have been possible without distractions, thus resulting in an overall performance improvement. There are several other ways that distractions might, under some circumstances, lead to improved performance due to an increase in an individual's general motivational or drive level.

It is argued that competing reaction tendencies or conflicts can lead to an increase in drive or motivation. For example, two athletes may be more motivated to perform well when competing against each other than when on their own. With certain tasks, distraction can be thought of as a competing tendency conflicting with performance of the task in hand. In this way, distraction might act to increase the motivation level of a performer and subsequently lead to contributing to improved performance, particularly with respect to simple tasks (Sanders and Baron, 1975).

A final way in which distraction might be explained to improve task performance concerns the idea of uncertainty. When individuals are unsure of exactly when they are going to be distracted, it is highly likely that there will be an element of uncertainty present. Averill (1973) indicated that if uncertainty is reduced in a situation, then levels of stress are also reduced. It follows that if levels of uncertainty are positively related to levels of stress and that distraction is related to uncertainty, then distraction on a task may lead to increased levels of stress. Sanders and Baron (1975) also showed that greater stress can produce motivation-like effects and that this may account for why distraction in certain circumstances seems to result in facilitation. Zajonc (1965) provided a note of scepticism by stating that *'evidence that the mere presence of others raises the arousal level is indirect and scanty'* (p.274) and further argued that there was some evidence that conditions such as stress lower the arousal level.

There are two experimental paradigms in the area of social facilitation. So far the paradigm that might loosely be called 'audience effects' has been primarily considered but there is another paradigm which can be termed 'co-action effects'. Co-action effects involve the examination of behaviour when it occurs in the presence of other individuals who are also engaged in the same activity. A paradigm of co-action is perhaps more complex than that involving audience effects. With co-action effects, subjects are observed all simultaneously engaging in the same activity and in full view of each other. The question that arises is whether driving behaviour can be incorporated within this definition.

Much of the research concerned with co-action effects has taken place with animals as subjects. Perhaps the best known example is that of Chen (1937; cited in Klopfer and Hailman, 1967). Chen observed ants working alone or in groups of two or three and found that the presence of other ants enhanced the emission of dominant and well developed responses; a finding extremely similar to that caused by audience effects. If the effect is identical then it follows that learning should be inhibited in the presence of other learners which has been shown in other animal research (Klopfer and Hailman, 1967).

Allport (1920) found similar results studying co-action effects with human subjects. Despite some conflicting research results (Travis, 1925), most studies have demonstrated that the presence of others as spectators or as co-actors enhances the emission of dominant responses.

7.1.2.2 Driving with passengers

With regard to car driving behaviour, it is perhaps questionable whether passenger distraction does facilitate the task of driving due to any of the concepts mentioned above. It is arguable that the technique of car driving is a complex task and that the majority of the empirical research which supports the idea that distraction can facilitate task performance involves performance on simple tasks. Indeed, the same can be said of social facilitation in the wider sense, not just involving distraction effects, in that social facilitation is shown to be particularly effective with simple tasks. Zajonc (1965) supported this by stating that *'simple motor responses are particularly sensitive to social facilitation effects'* (p.269).

With respect to car driving behaviour, the presence of passengers within a car can be seen as representing an audience. It is perhaps more difficult to argue that the presence of other drivers on the road could lead to co-action effects, although Yinon and Levian (1988) demonstrated that the mere presence of other drivers increased the frequency of starting to cross an intersection before the onset of the green light. However, as mentioned above, the presence of other drivers on the road may also provide cues as to appropriate or inappropriate responses in the way of imitation or vicarious learning. The most obvious example of this would be signalling behaviour.

As explained, the presence of spectators often affects the performance of an individual on any particular task. Driving behaviour is no different in that the presence of passengers appears to have an effect on driver performance. The influence of others on the performance of driving is particularly important because a driver's level of performance can be a matter of life and death. In the majority of studies, it has been found that passenger presence significantly improves conformity to general traffic rules such as keeping to speed limits (Lawshe, 1940), and stopping correctly (Feest, 1968). With respect to informal rules, accompanied drivers tend to take fewer risks in terms of car following behaviour (Ebbesen and Haney, 1973) and fewer risks when crossing two lanes of traffic for a right turn manoeuvre (Carlson and Cooper, 1974).

Findings appear to show that the presence of passengers in a car generally tends to improve driver strategic performance. However, it cannot be concluded that there is a direct causal relationship between passenger presence and improved, more careful driving because drivers who are accompanied in their cars may be inherently more cautious or qualitatively different from the solo drivers observed in the studies (Wilde, 1980), although such an explanation would appear unlikely.

A major problem with the drive theory to explain social facilitation is that with respect to car driving it is difficult to see how different types of passengers always lead to the enhancement of dominant responses from the driver. A number of studies have demonstrated that different types of passengers lead to different effects on a driver's performance (Black, 1978, cited in Knapper and Cropley, 1981; Kruger, 1990; Reason *et al.*, 1991). A control theory explanation of social facilitation would appear to take account of this in that individual drivers perceive passenger expectations of correct and appropriate behavioural standards.

Most of the theories discussed so far deal with social facilitation effects in terms of a change in the arousal or drive state of the individual. However, it is possible for audience effects to be explained in terms of control theory. Carver and Scheier (1981) argued that the presence of an audience makes an individual reassess his/her own performance in the light of the requirements of some currently salient standard of behaviour (dictated by the audience) which results in *'enhanced conformity to the standard'* (Carver and Scheier, 1981; p.289). Behaviour is modified when there is a discrepancy between the individual's performance and what that individual believes the audience expects. Carver and

Scheier (*op cit*) argued that it is this discrepancy reduction, rather than a drive state that is the cause of social facilitation effects.

The questions to be asked are 'Can driving be classified as a well-practised enough activity so that these audience (passenger) effects can be explained in terms of the social facilitation of dominant responses?' and further 'Are the dominant responses of the majority of drivers, actions that result in improved, safer driving?'

A problem which arises when trying to answer such questions in the affirmative is that the norms of the road would appear to vary dependent on the driver's age and sex. Harrington and McBride (1970) found evidence for this in that younger males were most likely to commit road traffic law violations such as speeding. Reason *et al.* (1991) reported a complementary finding that older females were the least likely category to commit violations. However, as they acknowledged, this study involved a self-report questionnaire and the findings may have been indicative of the fact that older females were less likely to admit to violations than other driver groups. It was also found that drivers who admitted to a large number of violations nevertheless rated themselves as especially good drivers. There would appear to be two possible explanations for this. Firstly, and perhaps most unlikely, that these drivers believe that other drivers commit even more violations than the large number they admit to or secondly, and more likely, that for these drivers the criteria for being a good driver are not necessarily restricted or related to compliance with the law. It is possible that some of the norms with which these drivers operate are related to breaking the law as opposed to complying to it. Following from this with a 'drive' theory explanation, for a particular subset of drivers, the presence of passengers may enhance dominant responses which might lead to increased levels of violations.

Schuman and Pelz (1972) listed thirteen variables that were linked to accidents and violations amongst a group of 16-24 year olds, one of them being that driving behaviour is affected by passengers. However, it is not simply a question of passenger presence enhancing dominant responses because a driver's responses are dependent not only on his/her own age and sex, but also on the age and sex of the passengers that are present in the car.

Evidence to demonstrate this was presented by Kruger (1990) who proposed a socio-ecological model of driving performance which sees the driver with passengers as a two channel information processing system having to evaluate which of the two channels (the 'social' or the 'performance' channel) is the more important. Kruger (*op cit*) argued that there are three variables, namely alcohol, the driver and the passenger which have an effect on the evaluation of the two channels in the decision process. Kruger (*op cit*) assumed that the relationship between the performance and the social channel can be conflict and that '*the driving performance level must be lower when passengers are in the car. As a result, the probability of causing an accident should increase*' (p.3). This view would appear to contradict the 'drive' theory that passenger effects lead to an enhancement of dominant responses in any behaviour and that in certain circumstances this could lead to an improvement in performance level, if the task being performed (in this case, driving) can be classified as a well-learnt and well practised activity.

Kruger (1990) also examined data on alcohol-related accidents and number of passengers present at the time of the accidents over a six year period and showed that solo accidents were under-represented and accidents with two or more passengers were markedly over-represented. Kruger (*op cit*) concluded that the 'co-task passenger' interferes significantly with the driving task and that the reason why the accident risk reduces when three or more passengers are present is due to the fact that it is easier for a driver to disengage him/herself from the social context. However, it is questionable whether such a straightforward picture does emerge from these results in that with a greater number of passengers there may be more conflicting norms present.

As further evidence, Kruger (1990) examined the 1985 United States accident data cross-classified for the sex of both passengers, age of driver and blood alcohol content (BAC). The most extreme BACs were found when male drivers were accompanied by male passengers and the lowest when females were driving with female passengers. Such findings may actually indicate particular patterns of social drinking prior to driving and/or differing patterns of support or disapproval of certain groups in the general population. That is, male passengers may be perceived as having more tolerant attitudes towards driving violations, in this case, drink driving and thus a direct 'in-car' passenger influence may not exist. Indeed, Kruger (*op cit*) stated that previous experiments had *'proved that social conditions have a strong impact on drinking behaviour'* (p.5) and that *'the consumption of alcohol depends on the social company and vice versa'* (p.6). It must also be noted that 94.24% of the accidents analysed involved non-BAC drivers and therefore alcohol may not be such a strong factor although it is recognised that passengers over the BAC limit may have an effect on driver behaviour which was not examined by Kruger (*op cit*).

Some of the present research was concerned with looking at social influences on driving behaviour including passenger effects and contributing to the question of under what circumstances a passenger or passengers, might result in the driver driving more safely; or conversely, in what ways a passenger or passengers co-acting with the driver might increase the chances of an accident?

The work conducted by Kruger (1990) suggests a 'limited channel capacity' theory to account for passenger effects. It is proposed that passengers are a possible source of distraction for the driver, who as a consequence concentrates less on the demands of driving. However, in common with the 'drive' state theory, few distinctions are made between type of passenger beyond the fact that different amounts of conversation may occur between different driver/passenger combinations. Although it is possible that different combinations of passengers have a greater or lesser distraction effect and that drivers vary to the extent to which they can ignore such potential distractions, there would appear to be more complete theoretical explanations for passenger effects (Ingham, 1991b).

An explanation for the phenomenon of passenger effect on driving behaviour based purely on distraction of the driver can be questioned. With this explanation, it is argued that passengers distract drivers so that the driver concentrates less on the task of driving and subsequently makes slower progress. However the results reported by Reason *et al.* (1991) showed that this particular effect only occurred when the passengers were older and female and therefore cannot explain or generalise to those effects found with other groups of passengers. Indeed, Black (1978, cited Knapper and Cropley, 1981) found that the presence of passengers led to increased compliance with the law in respect to speeding and seat belt wearing and these effects would not be expected following a distraction hypothesis to explain passenger effects. However, as mentioned above, Sanders and Baron (1975) demonstrated how distraction can in certain circumstances improve task performance.

Reason *et al.* (1991) provided further evidence of different effects on driver behaviour dependent on different passenger type. They found that signalling behaviour decreased by a significant level only when younger males or older females were driver/passenger combinations in cars and suggested that this may be due to a distraction effect. However, they acknowledged this was an unlikely explanation since it only occurred with this particular driver/passenger combination. The speculative explanation of this was that these two groups (younger males and older females) have been shown in earlier studies (Reason *et al.*, 1989) to represent the two behavioural extremes of lawfulness and that therefore drivers carrying such passengers may have to *'make greater adjustments to their behaviour to match the perceived standards of their passengers than drivers carrying other passengers, such that they give less attention to the peripheral, or perhaps the less obvious aspects of driving'* (Reason *et al.*, 1991, p.38).

An alternative explanation to account for passenger effects involves drivers perceiving passengers as representing particular social norms of what constitutes 'good driving'. It is suggested that drivers alter their driving to the perceived demands of these norms. This suggestion can explain the finding by Reason *et al.* (1991) that younger males and older females represent the least and most law-abiding drivers. It would appear that if a driver is carrying an older female passenger then, for example, adhering to the speed limit may be the salient norm whether this is overtly or covertly expressed. By contrast, if the passenger is a young male, then the salient norm may be that 'good' driving is being able to drive fast or take risks successfully (Harrington and McBride, 1970). Reason *et al.* (1991) added, however, that *'only young male drivers are sensitive to the prescriptions of this norm'* (p.38). However, it might be the case that all drivers are aware of the 'expected norms' in the driving situation, but that different passengers have differing status as influencers on a person's behaviour (Fishbein and Ajzen, 1980). The driver with passengers present has to want to manage the impression he/she gives to the passenger(s) and thus gain respect through his/her driving behaviour. Driver groups may vary in the extent to which they want to acknowledge or realise that passenger evaluation of driving is occurring and it may be that the young male driver group most wish to manage the impression that they give. For example, Assailly (1991) argued that women see road risk as less relevant and less useful and are therefore less likely to regard risky driving as important and status enhancing.

A recent study by Parker *et al.* (1992) suggests that passenger presence effects are not merely dependent on type of driver and passenger but on other factors such as time of day. Their results appeared to show that the same driver/passenger combinations resulted in different driving behaviour during nighttime or daytime driving. They concluded that *'these interaction effects have to be accounted for in terms of factors such as the 'social' nature of nighttime driving...encouraging a more carefree and less responsible approach to driving than the more 'business' nature of daytime driving'* (p.129). Again, such work emphasises the importance of the 'social perspective' of car driving and hints at the distinction mentioned above between 'expressive' and 'practical' driving. In addition, this work suggests that passenger effects interact with other social influences and perhaps cannot strictly be examined in isolation.

Another possible explanation is derived from risk homeostasis theory (Wilde, 1982a, 1982b; Wilde and Murdoch, 1982). With this theory, it is proposed that drivers have an idea of a constant level of risk that they are willing to accept on the road and that their behaviour changes in response to their apprehension of changing circumstances of risk. For example, a driver would slow down in order to lower the risk level in response to foggy road conditions which would heighten risk levels to an unacceptable level without the driver's appropriate modification to behaviour. Aspects of this theory have been used with respect to seat belt use. That is, people who have been forced by legislation to wear seat belts might in turn feel safer with the added protection that it affords and thus experience a lower level of risk of injury. The argument, based on risk homeostasis theory, is whether seat belt wearing drivers adapt to the new lower level of perceived risk or whether they compensate for this new lower level by driving in a more risky manner which enables their self-perceived level of risk to remain at a similar level to that which it was before the introduction of the physical changes, in this case, seat belt use (Koornstra, 1990).

Risk homeostasis theory related to passenger effects on car driver behaviour predicts that accompanied drivers are aware, at some level, that passengers increase risk levels whilst driving, possibly through distraction, and therefore drivers compensate for this increased risk level by reducing speed. Two problems emerge with this theory. Firstly, that such an explanation cannot adequately explain all different driver/passenger effects. Secondly, and most damaging, are the findings that young male drivers with young male passengers actually tend to drive faster than solo young male drivers and that older male drivers with younger female passengers tend to drive faster than solo older males (Reason *et al.*, 1991).

It would appear that norm-based theories seem to be able to account for social facilitation effects more adequately when the task being performed is as complex as driving undoubtedly is and/or when an audience might be expected to have views of its own on the correct performance of the task in question.

7.1.2.3 Music and mood

Listening to music whilst driving may also be a proximal social influence on driver behaviour. It is self-evident that music can have effects on mood in a wider domain so it remains a possibility that these effects could occur in the more specific domain of car driving. The effects of music and mood would appear to be inter-linked and often it is unclear as to which precedes the other. McGuire (1970) showed how bad 'moods' as a reaction to a temporary and unpleasant life event may cause a kind of temporary or short term state of 'accident proneness' amongst certain drivers. However, perhaps more accurately, these types of bad mood would appear to be more of a 'bad state of adjustment' rather than a mood since they are likely to be apparent for a greater length of time (from several weeks to months) than a mood might reasonably be expected to last. Firth and Geoffery (1980), using a qualitative methodology, stated that many young drivers' behaviour was based on spur of the moment decisions influenced by their current mood in combination with peer group pressure. Reason *et al.* (1991) showed that higher levels of both good and bad mood are associated with higher levels of reported aberrant driving behaviour and that different types of behaviour were associated with different moods.

The effect of music on a given behaviour can be examined in terms of an 'optimal arousal' hypothesis. Briefly explained, the hypothesis suggests that as background music becomes louder, the person's arousal or activation level is increased, which leads to an increase in the speed of the on-going activity. Smith and Curnow (1966) demonstrated that shoppers in a large supermarket bought goods more rapidly (but still the same amounts) when loud background music was played. It is interesting to speculate whether these effects might also be applicable to the car driving domain.

An individual performing any task will do so best under intermediate levels of stress. Stress here will be loosely defined as the result of the demands that the environment places on the individual. Remove all input and the person becomes bored, increase the level too much and the person finds it hard to cope. Thus, there is an optimal level of stress or arousal. For an easy task the optimal level of irrelevant stimulation (stress) will be much higher than it is for a difficult task. Such an hypothesis may be applicable to car driving behaviour (Smith and Curnow, 1966). For example, it is known that some lorry drivers turn off motorways and go on 'A' roads because they are more stimulating, whilst others vary the pace of their journeys. Is it possible that in a similar way, the radio cassette, or talking to passengers, may help car driving behaviour in certain circumstances and hinder in others?

Parallels can be drawn to research into the use of car phones (Stein, 1987). Brookhuis, De Vries and De Ward (1991) found that the basic control of the vehicle (skill level) was relatively unaffected by additional load unless manual dialing of the telephone was required. However, at the tactical level of driving, such as reacting to other traffic participants there was a significant deterioration in driving performance. Such effects may be linked with the limited 'channel capacity' theory (above) where concentration is affected when too many demands are placed on an individual. This theoretical approach has most often been applied to passenger effects (Kruger, 1990). However, it might be the case that this theoretical approach can be applied to other social influences (for example, listening to radio cassettes) and not just passengers within the driving domain.

7.2 Passengers

Drivers were asked if the presence of passengers in the car had any effect on their driving behaviour. As many as 90% of the drivers stated that passenger presence did have some effect.

The extent to which passenger presence affected driver behaviour varied considerably. Most of the drivers recognised that they drove differently on their own from when they were accompanied by passengers. However, more of the 'safe' drivers stated that these effects were quite small and insignificant in that they tried to drive in the same way regardless of passenger presence.

Some typical comments from the drivers were:
#34: Slightly, if you're with your Granny or parents you drive slower, not that much though...but I don't think I drive that differently, I drive safely enough on my own - I drive the same all the time. (Safe driver, 19 years - age at time of Study 1)
#37: With a parent or older person I might slow down a bit...but with my friends I just drive the way I want to and that's it. (Safe driver, 20 years)
#52: I'm a little more conscious with my Dad in the car...but the rest about the same. (Safe driver, 24 years)

Some of the drivers drove fastest and riskiest when they were on their own since they felt that they were only responsible for their own well being. Drivers often ignored the fact that they could injure other road users.

For example:
#3: I think I drive fastest of all on my own because I haven't got people screaming and distracting me. (Unsafe driver, 18 years)
#7: Usually I drive fastest on my own because it's just me. (Added as an afterthought) I suppose I shouldn't really do that because when I'm driving on my own I'm still putting other people on the road at risk. (Unsafe driver, 18 years)
#11: If there's nobody in the car you are going to do one of two things: you either just take it easy and you drive and you don't care how fast you're going or you think 'Oh go on, let's open it up a bit' and go down the road because you're not worried about crashing because if you crash it's only you in the car... (Unsafe driver, 19 years)

Typical comments from the 'safe' drivers included:
#31: I think I tend to be a bit more risky when I'm on my own because I don't feel responsible for others. (Safe driver, 18 years)
#33: when I haven't got someone next to me I'm prepared to take a slightly

greater risk...because it is only me I'm worried about. #47: If I was on my own and I could see it was safe, I do like to go round corners fast... (Safe driver, 22 years)

The two main reasons why drivers changed their driving when accompanied by passengers were (a) that they felt that passengers expected them to drive in a certain way, or (b) that they themselves felt a greater responsibility when driving passengers, and thus modified their driving accordingly. Drivers felt that they took into account passenger needs or expectations when driving, recognising that passengers may gain an impression of them through their approach to driving. However, this could either have a positive or negative effect on driving.

For example:

#3: Some people like to be scared, so you scare them and some people like to be pampered so you drive gently. Generally my male friends like to be scared, I want them to enjoy being driven. ...I drive to keep passengers happy. (Unsafe driver, 18 years)

#19: It all depends, all my friends are different characters; there's a couple who would love to see me go a lot faster, I'd probably go a bit faster but I wouldn't let them actually influence me into taking a risk. (Unsafe driver, 21 years)

The 'safe' drivers typically reported:

#41: I'm quite considerate, I know what it's like to be a passenger...so I tend to drive sort of 'chauffeur-like' when passengers are in the car... I tend to adapt dependent on the passenger. (Safe driver, 21 years)

#42: With my fiancee's Mum and Dad, I tend to drive as though I've got to please them, try and make them feel comfortable, a lot more conscious, a lot slower definitely...I drive to keep them happy. (Safe driver, 21 years)

#43: My mother expects me to drive like she does... (Safe driver, 21 years)

#45: When I've got older people in the car who I know obviously gain an

impression of me by the way I drive, I do drive very sensibly. (Safe driver, 21 years)

The vast majority of the drivers drove in a different style dependent on the type of passenger. Being accompanied by parents generally led to more careful driving behaviour for a variety of reasons. The most common was that the young drivers wished to present a good impression of themselves to their parents. For some of the drivers creating a good impression was essential to enable future access to the family car. Other drivers stated that they thought their parents felt they drove badly (like all young men), and therefore they were determined to show they could drive well. There were subtle differences mentioned between driving with one's father and with one's mother. With their father in the car the drivers stated that it was often very off-putting and that they wanted to impress him with their driving skills, but that his presence made them nervous and forced them into unnecessary errors. However, with their mother in the car drivers stated that they drove in a particular fashion in order not to worry her.

Some of the 'unsafe' drivers commented:

#1: The obvious one is you slow down with your parents... (Unsafe driver, 17 years)

#4: My parents have heard stories about my friends and maybe of me, so when they come with me I've got to show them that it isn't true, I'm not stupid I'm not irresponsible... (Unsafe driver, 18 years)

#6: With my Mother and Father I generally try and slow down, mainly because it's your family, if something did happen, you're going to feel a lot more guilty - I know it's terrible saying that if you had friends in the car, but with family it's different really... (Unsafe driver, 18 years)

#28: With relatives you don't want them to think of you as a bad driver so you deliberately go out of your way to show them that you are a good driver. (Unsafe driver, 18 years)

Some of the 'safe' drivers commented:

#33: I drive a lot more slowly and lose confidence when Dad is in the car, when my Mum's in the car it's not so bad. I'm expected to drive sensibly when Dad is in the car with me, it does have an effect who's in the car with you. (Safe driver, 19 years)

#40: With parents I'm more conscious of speed limits because up till now my motoring was virtually sponsored by them, so they've always had a comeback on me in the use of their cars. (Safe driver, 21 years)

#45: Especially if it's the girlfriend's parents, I've got to give a good impression! When they're in the car with me I like to set an example. (Safe driver, 21 years)

#48: If my Dad is in the car I feel I should look for everything and anything - if it's my mate I'll be driving sensibly but not half as 'on-aware' as if Dad is in the car... (Safe driver, 22 years)

There were further differences between the 'unsafe' and 'safe' driver groups in their regard to type of passenger presence. The 'safe' drivers were fastest and least 'safe' on their own with no passengers. These drivers did not distinguish between the type of passenger to as great an extent as the 'unsafe' drivers. In general, the 'safe' drivers tended to treat all passengers as the same, that is people who want a slower, more comfortable drive. The 'unsafe' drivers, however, distinguished between passenger type to a greater degree. More of the 'unsafe' drivers, although still driving fast when alone, also tended to drive fast with their male 'mates' in the car. The reason most commonly given was that these 'mates' expect or like them to drive in this particular manner. For example, more of the 'unsafe' drivers admitted that there had been times when their male passengers had encouraged them to race on the road.

Nevertheless 'safe' drivers were exposed to peer pressures encouraging unsafe driving practices, but more frequently, they were able to ignore it. However, this is not a blanket distinction.

For example:

#5: Suppose you've got a nice young girl next to you, you tend to pose a bit or your mates sitting next to you. ...they'd say 'Go on try and get past that one' things like that and 'beat him, beat her, fly round this corner, skid it on this', you'd put your foot down on a wet roundabout and go flying everywhere for a laugh; not anymore, we've normally got music blaring. (Unsafe driver, 18 years)

#10: I tend to drive faster when I have my other mates in the car with me. (Unsafe driver, 19 years)

#11: When you've got friends in the car it creates an atmosphere and whatever atmosphere that is I think it goes into your driving... They say 'Go for it', it might be a dodgy road, they say 'Go on, get around this' and you do it because you're already pissed off with the car in front and you think 'Oh for God's sake go for it' and you do; it's just like the last straw... (Unsafe driver, 19 years)

#12: A few friends say 'How about slowing down?' and some say 'How about speeding up?' The girls mostly say slow down and the guys say speed up. (Unsafe driver, 19 years)

#18: (With male friends) I'll drive faster than what I should, do silly things with the wheel, it would be more than showing off, it would be funny-ish, hopefully they'd laugh unless they got scared and then they'd leave the car, you get them jovial...we all play football and it's jovial spirit, wind down the windows and shout at people in the road. (Unsafe driver, 20 years)

#27: Particularly if it was just friends then I'd say my driving was quite erratic, because I'm not concentrating, I'm chatting and perhaps an element of sort of looking confident, showing off and looking as though this is real easy... (Unsafe driver, 25 years)

Some of the 'safe' drivers commented:

#39: I've had it from people who don't drive. Things like 'Come on cut across there' or 'What did you stop there for? You could've got through those lights'; I take it with a pinch of salt and treat them as ignorant. (Safe driver, 20 years)

#43: I'd drive slower with my friends (than alone) and my mother I'd take no risk at all with. (Safe driver, 21 years)

#46: If there are passengers there, I treat them all the same... (Safe driver, 22 years)
#55: I drive exactly how I drive on my own with my friends in my car. (Safe driver, 17 years)

Driving with a girlfriend in the car led to a number of different approaches. A few drivers stated that they were more likely to show off with their girlfriend in the car and thus drive less safely, whilst others claimed that their girlfriend would encourage them to drive slower and more safely.

Some of the 'unsafe' drivers reported:
#5: She'll moan, she'll moan, but because we have been going out a long time I don't show off anymore, it's like anyone else sitting next to me, so I don't need to show off so often. (Unsafe driver, 18 years)
#11: If you've got your girlfriend in the car you're going to be more caring and again if you've got children in the car you're going to be more careful. (Unsafe driver, 19 years)
#15: I'm affected by my girlfriend because she gives me loads of shit if I go over 120 or whatever, she's saying 'slow down, slow down,' she doesn't like going that fast. (Unsafe driver, 20 years)
#18: My girlfriend doesn't like it so she tells me off, but I'd probably drive the same because she doesn't like it, to wind her up. It's all logical and rational. She'd tell me I'm showing off and not very clever and I know she's right but I ignore her. (Unsafe driver, 20 years)

The 'safe' drivers reported similar effects:
#31: My girlfriend nags a lot about my driving, she gets a bit scared in the car...she points everything out as though she was driving, it's quite good because there have been occasions when I haven't seen cars that've stopped. She points out if I'm doing something stupid, I'm pretty good with her in the car. (Safe driver, 18 years)
#42: Take my fiancee, definitely more safer because I know she's a nervous

passenger. (Safe driver, 21 years)
#45: When my girlfriend is in the car with me, I drive quite sensibly, I don't do anything stupid, I spend most of my time with her so very safe. (Safe driver, 21 years)
#48: If my girlfriend is in the car, I'll be driving safely. (Safe driver, 22 years)

Many of the drivers also mentioned that they had had difficulties with drunk passengers whilst driving. Many of the drivers had had passengers grab the steering wheel or pull on the handbrake and generally mess about in the car which, in turn, had a detrimental effect on driver performance. In addition, drunk passengers were more likely to encourage unsafe driving practices. The drivers had different ways of coping with such situations, some choosing to ignore them whilst others stopped their cars and let their friends walk home.

With over 90% of all the drivers admitting that passengers have some effect on their driving behaviour, it is interesting to ponder to what extent, if any, passengers should be responsible for a driver's behaviour. One driver, who was ridiculed by his male peers for not driving how they do, illustrated this problem by stating that it is often difficult to resist such pressures: *#43: It is hard, but then I've always been like that, it's a licence, you only get it once and to do it and lose it through them would be silly. (Safe driver, 21 years).*

7.3 Radio cassette use

The reported effects of radio cassette use are likely to be significant since young male drivers (17-25 years) listen to radio cassettes for about 70% of the time that they are driving (Section 3.3.4).

Drivers were asked if they thought that listening to a radio/cassette affected their driving behaviour. Some of the drivers mentioned the obvious distracting effects of the mechanical aspects of operating the radio/cassette including retuning the radio and turning the cassette over. However, with more modern up-to-date models these adverse effects are being surmounted.

Similar 'operating' difficulties were reported by both groups of drivers:
#11: I bought it separately from the car, auto reverse because you don't want to be fiddling with your cassette player all the time...(Unsafe driver, 19 years)
#22: a slight distraction when the tape comes to an end... (Unsafe driver, 22 years)
#40: A friend had a new radio in his car...he was fiddling with his radio, hit a kerb, did two and a half rolls down a bank and was slightly injured... (Safe driver, 21 years)

Some of the drivers, but more in the 'safe' driver group, mentioned the beneficial effects of listening to the radio cassette late at night in order to keep them alert. The suggestion was that the extra stimulation of music or talk helped them to stay awake and concentrate. Other drivers (again more 'safe' drivers) also mentioned the radio cassette as beneficial on long journeys, again citing the extra stimulation provided by the radio cassette as an aid to safer driving through keeping boredom at bay.

For example:
#7: If I'm out late at night I have to put loud music on to wake me up a bit. (Unsafe driver, 18 years)
#30: Keeps me awake driving home late at night, probably keeps me alert... (Safe driver, 17 years)
#34: Sometimes you want music to relax you on a long journey. (Safe driver, 19 years)
#38: It wouldn't distract me from the driving but it would distract me from the boredom of driving, it's sort of fatigue preventing. (Safe driver, 20 years)

As expected, many drivers stated that music and mood were inextricably linked. Some drivers stated that the music dictated their mood, whilst others stated that their mood dictated their choice of music. For those latter drivers, their driving behaviour was more affected by their mood than the music, which merely reflected their mood.

For example:

#1: Not just the music but your mood and therefore you choose the music. If I'm really hyped up I'll put on some really fast music and I'll probably drive faster; it's partly to do with the music but a lot to do with how I'm feeling at the time. (Unsafe driver, 17 years)

#16: If I'm in a good mood I'll play something a bit louder and I drive a bit faster... (Unsafe driver, 20 years)

#50: You select the music for what mood you are in... (Safe driver, 22 years)

Some drivers stated that what music they listened to did affect their subsequent driving behaviour. Slightly more of the 'unsafe' drivers (65%) than 'safe' drivers (52%) stated that they were adversely affected by having the radio cassette on. In addition, these effects were noticeably more pronounced amongst the 'unsafe' drivers. The effects of music obviously varied between people although there were a few patterns which seemed to emerge. Generally, fast, up-tempo, loud music was associated with a more aggressive driving style. Many drivers stated that this was not <u>necessarily</u> linked to an increase in speed, but faster gear changes, more abrupt braking and acceleration. In contrast, slower, more peaceful music was associated with a calmer driving style.

Some of the 'unsafe' drivers reported:

#3: I mean there are different effects of music, something like 'Bat out of Hell' (a fast rock track) is lethal to drive to 'cos you just get fast and faster and you don't realise it. (Unsafe driver, 18 years)

#4: Listening to Heavy Music affects things like gear changes and stuff like that; you slam your foot on the clutch and knock it into gear, but if I'm listening to Simon and Garfunkel, it's peaceful, it's smooth, it sort of relaxes me. (Unsafe driver, 18 years)

#5: If it's a really good song on loud that makes you put your foot down...it does

affect me, sometimes when the music is on loud it makes your mind wander. I find it dangerous sometimes. I might even just turn it down a little because I know it does affect me... (Unsafe driver, 18 years)

#6: If you have a fast beat; it does sort of, you try to keep up with that beat, all my music is on the same sort of lines, Eric Clapton or Madonna. (Unsafe driver, 18 years)

#14: ...on Capital Radio there is a programme called 'Drivetime' which plays, fast, beaty music and I think it is a bad idea because it puts you in the mood, you feel happy and become more aggressive in the car. (Unsafe driver, 20 years)

Some of the 'safe' drivers commented:

#33: There's definitely some music you want to put your foot down to, something with a beat to it; although I'm ashamed to admit it because it shouldn't really. (Safe driver, 19 years)

#48: I think I feel a more aggressive driver with a louder heavier beat type of music, with a slower classical music it makes you feel more relaxed. (Safe driver, 22 years)

More of the 'safe' drivers recognised the potential danger of having music on too loud in the car and had thus adapted their behaviour accordingly. Some of the drivers spoke of the danger of becoming too isolated from the driving situation, getting lost in the their own thoughts and a general 'dulling of the senses', whilst others mentioned the practical problems of not hearing other cars, their own engine noise and even, in one case, a fire engine!

Some typical comments from the drivers were:

#20: I had it on loud and didn't hear the fire engine...I remember driving along, singing and you think 'I haven't looked in the mirror for a while'. (Unsafe driver, 21 years)

#31: I feel a lot more in touch when I can hear rather than when I've got the music on and the windows up, I feel a bit out of touch with everything, I'm just my

own little self, I lose what everyone else is doing around me. (Safe driver, 18 years)

#46: Maybe it would start to but then you'd think 'hang on a minute this music is starting to get to me'... (Safe driver, 22 years)

#54: Some good music, if turned up loud, that has an effect, but I keep it down deliberately for that reason. I found when I started driving at 17 or 18 I put my best tapes in the car turned them up and I was going round roundabouts too fast, that sort of thing, I realised and I never turn it up now. (Safe driver, 19 years)

#56: I'm aware of the effect and so if I've noticed it happening I try and ignore it. (Safe driver, 25 years)

7.4 Mood

There was a significant difference between the reported effects of mood on driving behaviour between the two driver groups. 'Unsafe' drivers reported being affected by their mood to a much larger extent than the 'safe' drivers. This may be due to the fact that, for 'unsafe' drivers, the act of car driving is regarded more as an expressive (than practical) activity and, as such, is perhaps more likely to reflect one's mood (Section 7.2).

Generally, the drivers stated that their driving behaviour roughly reflected their mood. Thus, being in a bad or angry mood led to more aggressive, faster and less safe driving. For 'safe' drivers, being in a good mood most often resulted in 'normal' or 'average' driving. For 'unsafe' drivers, however, it occasionally led to more expansive, carefree and 'enjoyable' driving. The effects of good mood were reported as less marked than bad mood and not necessarily detrimental to driver behaviour.

Being in a bad mood would appear to have an adverse effect on driving behaviour and this effect appears to be most pronounced amongst the 'unsafe' driver group.

For example:

#5: If I'm angry, I'll go a bit faster and take my anger out on that. (Unsafe driver, 18 years)

#9: If I'm in a good mood you're content to drive at 70 or drive as fast as you can, enjoying it; but if I'm in a bad mood, 'Oh dear me!' I'm cutting them up, driving terrible, driving as fast as you can, not worrying...(Unsafe driver, 19 years)

#14: If I'm depressed I drive quite gently, if I'm pissed off I drive like a lunatic. (Unsafe driver, 20 years)

#16: If I'm in a good mood I drive more aggressively and if I'm in a bad mood I drive more aggressively, but if I'm in a middle mood I don't! (Unsafe driver, 20 years)

#20: If I'm wound up I do tend to drive a bit faster...actually when I'm in a mood I'm a more aggressive driver, if there's a gap I'll go through it and I tend not to give way... (Unsafe driver, 21 years)

#23: Angry tends to be the worst, I take it out on the car, when I'm most risky... if I'm happy, things vary, sometimes I'm relaxed; it does affect me. (Unsafe driver, 23 years)

However, some typical comments by the 'safe' drivers were:

#33: Not at all, me and my girlfriend have had major rows and I've carried on driving normally. (Safe driver, 19 years)

#41: If I'm in a really bad mood I get very reactive to what people do on the road. (Safe driver, 21 years)

#43: Not really at all, I suppose it might do subconsciously but I don't notice it. (Safe driver, 21 years)

#48: A lot more aggressive, not dangerous; going through the gears quicker if I've had bad news or a bad day. (Safe driver, 22 years)

7.5 Other drivers

Drivers were also asked to what extent other driver actions on the road affected their mood and/or subsequent driving behaviour. Again, the 'unsafe' driver group were more affected by the actions of other drivers. It would appear that 'unsafe' drivers were more likely to get in a bad mood due to (what they saw as) the inappropriate or 'stupid' actions of other road users. These bad moods of drivers were likely to be exacerbated by other driver actions. A possible reason for this may be that the majority of other road users do not follow the same norms as to appropriate driving behaviour that 'unsafe' drivers hold. Risser (1990) argued that traffic behaviour of all participants is affected more by the existence and behaviour of other road users, including drivers, than any effects caused by traffic education, driving lessons, law and law enforcement.

Some of the 'unsafe' drivers reported:
#9: I hate it on the motorway when there's someone sitting in front of you doing 70 (mile/h) in the middle lane, I'd overtake them on the inside to prove a point... (Unsafe driver, 19 years)
#24: It affects me quite a lot, you might come up behind an old couple and they're just driving stupidly... (Unsafe driver, 23 years)
#28: If I see someone doing a silly thing, that will make me angry. (Unsafe driver, 18 years)

'Safe' drivers were less slightly less affected:
#31: If I was angry already it might make it worse and I wouldn't concentrate as much. Only a bit, for the short term. (Safe driver, 18 years)
#30: They (other drivers) annoy me, but I don't get in the car in a good mood and get out in a bad mood just because people have been driving badly... (Safe driver, 17 years)
#34: Other drivers compound whatever mood you are in to start with. (Safe driver, 19 years)

7.6 Discussion

A number of social influences which occur within the immediate social context of driving have been identified as important factors in both 'safe' and 'unsafe' young driver behaviour.

The proximal effect of passengers would appear to be particularly important since 90% of the drivers reported passenger effects. Such findings confirm the work of Black (1978, cited in Knapper and Cropley, 1981), Evans and Wasielewski (1983) and Lawshe (1940). However, two differences were found with these studies. Firstly, that passenger presence can have an adverse effect on driver behaviour (Kruger, 1990), in addition to the positive benefit previously found, and that differences emerge dependent on the specific details of the driver/passenger interaction. These findings are also supported by Reason *et al.* (1991), using a different method. The fact that similar findings emerge from different methodologies lends support to the results.

However, the 'car-following' method adopted by Reason *et al.* (1991), although enabling the distinction between age and sex of passenger could not determine the relationship of the passenger to the driver. This has also been shown to affect driver behaviour with particular reference to drivers' relations (particularly older), such as parents or grandparents. It was shown that unaccompanied drivers generally drove fastest on their own arguing that they were only responsible for their own safety. Such an argument reveals an egocentric viewpoint since other road users might be injured as a result of their risky actions.

Young drivers' explanations for the change in their driving behaviour when accompanied by passengers were that they felt passengers expected them to drive in a particular style or they felt greater responsibility when driving passengers. The first explanation is similar to the social facilitation one forwarded by Carver and Scheier (1981) whereby the driver modifies their behaviour to suit the expectations of the passenger. It would appear possible that these passenger expectations are not necessarily constantly the same and that they may, in turn, be influenced by other factors such as music, mood, other drivers or purpose of driving (ie primarily 'practical' or 'expressive'). Such an explanation would appear to be able to incorporate the important finding by Parker *et al.* (1992) that other social influences such as time of day have an effect on passenger influence.

A number of young drivers actually referred to the idea of the 'impression management' hypothesis, albeit in lay terms. They stated that they drove in a particular style because they wished the passengers to gain a favourable impression of them suggesting that this concept is applicable to the car driving domain.

The choice of a theoretical approach which could explain the passenger effects evidenced above can be illustrated with a hypothetical (but potentially realistic) example of a young male car driver who drives relatively safely and sedately when unaccompanied but drives in a faster and less safe manner with male peers and drives particularly safely when accompanied by parents. A 'drive' theory explanation would predict that when the driver was accompanied, the facilitation of dominant responses would occur. In this example, the driver being an experienced driver, the dominant responses when driving alone are safe manoeuvres and thus a 'drive' theory explanation would predict an increase in these dominant responses resulting in safer driving. This is indeed what happens when this driver is accompanied by parents in the car, but not when accompanied by his peer group. A 'drive' theory cannot adequately account for this driver's behaviour in terms of <u>all</u> passenger effects. However, a 'control' theory account can adequately explain this behaviour in that when accompanied, the driver adapts his driving to match the behavioural standards which he perceives that the differing groups of drivers expect. To continue with the example, this driver thus perceives that the peer group hold expectations of a drive in a faster, less safe manner (even if, in reality, they do not hold these views) whereas the driver perceives that the parents hold expectations of a drive in a slower, safer manner. These effects occur due to the driver's <u>perception</u> of the behavioural standards which the passengers hold and are not necessarily directly related to the <u>actual</u>

views that the passengers hold, in that a driver may perceive the expected behavioural standards of passengers incorrectly.

It was beyond the scope of the current study to examine the influence of different combinations of passengers on driver behaviour in detail, although results suggest that the effect is determined by the passenger type which the driver most wishes to impress or whom the driver views as being the most influential or important passenger. For younger male drivers it is likely that peer effects are of utmost importance, but if accompanied by an adult or parent (especially if this adult has any control over subsequent availability and access to the car) the driving behaviour exhibited will probably be modified to suit this particular passenger type above others and the expected behavioural actions would be displayed. Indeed, any peer passengers travelling with a parent would probably also expect the young male driver to adapt their driving behaviour to suit the parent or adult present.

Reason *et al.* (1991), examined the extent to which 'lack of regret' increases the likelihood of aberrant driver behaviour and found this to be a more important influence than immediate social constraints such as passenger influence. The (lack of) regret influence was not specifically examined in this current study and so little can be made of it. However, it should be noted that at no time during the interviews did any of the drivers mention regret at any of the actions they had performed on the road with the exception of drink driving behaviour. Moreover, drink driving behaviour was also shown to be related to peer, and hence, passenger effects suggesting that internal psychological factors such as regret are related to, and mediated by, peer and passenger effects.

The 'safe' group of drivers tended not to distinguish between passenger types to as great an extent as the 'unsafe' drivers. Indeed, the 'unsafe' group, on the whole, were more open to male peer passenger influence, whereas more of the 'safe' driver group were able to ignore it. This may be the result of the 'safe' driver group not placing such importance on the act of driving and it being of lesser importance in their lives; a hypothesis which is supported by the analysis of the two groups' differing 'car cultures' (Section 6.6).

It would seem that it is possible to distinguish between two types of passenger influence; the overt and the covert. Overt influence would include verbal exhortations to drive in a particular manner whereas covert influence would relate to more subtle expectations that the passenger communicates to the driver that they expect to be driven in a particular manner or style. It may be worthwhile to try to identify covert ways of influencing driver behaviour which could be used by passengers when in the company of a driver with whom they do not feel comfortable. It is arguable that virtually all drivers could drive safely if they chose to do so or were successfully persuaded to do so by passengers. Parker *et al.* (1992) suggest that publicity campaigns which highlight the disapproval of peers may be successful in persuading 'unsafe' young drivers to drive more safely. Indeed, results from the current study show that girlfriend/partner passenger effects do generally seem to lead to safer driving behaviour and therefore supports this line of argument.

More of the 'unsafe' drivers were affected by other driver actions; this might be seen as an example of 'co-action' effects, although it is difficult to see how the theory could be applied. It might be argued that the 'unsafe' drivers perform a number of risky manoeuvres and that the presence of other drivers enhances these responses, although the large number of SVAs experienced by the younger male group (suggesting the abscence of other drivers) questions this interpretation.

So far, only the <u>social</u> influences of passengers have been discussed. There are also <u>practical</u> difficulties that emerge with drunk passengers whose physical actions have an adverse effect on driver behaviour. Listening to a radio cassette whilst driving also has social and practical implications. Practical difficulties involve mechanical operation which have been shown to be a slight safety hazard in a similar way to manual dialing car phone use (Stein, 1987; Brookhuis, De Vries and De Waard, 1991). However, Stein (1987) reported that any practical task which diverts driver attention interacts with (increasing) age to impair driver control, so this is likely to be less of a problem for young drivers. Nevertheless, listening to music at high volume has been shown in some cases to limit the driver's awareness of surrounding traffic and this is likely to be more pertinent for younger drivers. Such findings were similar to those of Brookhuis, De Vries and De Waard (1991) who found that the 'tactical' awareness of drivers interacting with surrounding traffic was impaired to a greater extent than the skill aspects of driving impaired due to practical difficulties such as 'tuning' the radio. Some of the 'safe' drivers were aware of the adverse effect of listening to loud music and adapted their behaviour accordingly. However, there have been very few studies which have investigated the social effects of listening to a radio cassette whilst driving. Listening to music would appear to produce temporal changes in some individuals (more of the 'unsafe' than 'safe' drivers) which affect the way they drive. That is, drivers listening to fast, up-tempo music may, on occasions, drive in a more risky manner to suit the music.

With regard to the effects of the radio cassette, it would seem that the 'limited channel capacity' theory can be applied in certain circumstances. A number of drivers reported that on a deserted or quiet road it may be advantageous to have the radio on, but in busy town traffic (where 'tactical' awareness is most needed) it is possible that concentration will be adversely affected by extraneous stimulation, such as the radio. Use of the radio in these circumstances helps to maintain an optimal level of stimulation during the driving task. Thus, there are beneficial and adverse effects of radio cassette use dependent on the circumstance of the drive. This is similar to the finding that passenger presence can either lead to safer or less safe driving behaviour dependent on the passenger type. However, whilst a 'control' based theory involving expected behavioural standards or norms and impression management would appear to best explain passenger effects, radio cassette effects might best be explained as a result of the 'limited channel capacity theory' and the 'optimal arousal' hypothesis.

8 CONCLUSIONS AND IMPLICATIONS

8.1 Introduction

The two studies which have been reported set out to explore the reasons why young drivers are particularly over-represented in current accident statistics. The large database and multi- disciplinary approach (both quantitative and qualitative), has developed valuable insights into behaviour and performance of young drivers. These insights, and the research findings discussed previously, lead to implications for action and also give guidance for future work.

In 1987, the Department of Transport outlined an objective to reduce road casualties by one-third by the year 2000, using the average for the years 1981-1985 as a base figure (Department of Transport, 1987). In order to assist this objective and extend it beyond the year 2000, new initiatives, particularly those related to road user behaviour, have to be introduced which are based on, and developed from, empirical research. These studies are, therefore, particularly important because they have as their main focus younger car drivers.
Both studies have shown that a more social approach to the study of car driving, particularly young car driver behaviour, has merit. The meanings and motives which young drivers attach to driving behaviour in terms of a number of psychological concepts have been explored. These include social facilitation and peer influences, 'impression management', the status of actions and driver perceptions of ability and risk. It is recognised that other factors (possibly even driver skills!), do have a part to play in determining young driver behaviour, but that social factors and the 'social perspective' are extremely important and have been relatively unexplored to date.

The first study identified inter-group differences, the second study sought to explore intra-group differences by giving young drivers the opportunity to provide their own accounts and explanations for their driving behaviour based on their own realities and experiences.

Within-group differences among young male drivers do exist. It is therefore incorrect to label and stereotype all young male drivers as 'unsafe'. There is a danger that stereotyping of individuals may lead to self-stereotyping whereby individuals fulfil the roles expected of them. The use of traditional distinguishing variables such as age, sex and driving experience have been shown to be of limited use as explanatory factors for unsafe driving behaviour. They show who (i.e. young drivers) are over-represented in the accident statistics but not why. Many factors are implicated which help to explain why some drivers are 'safe' and others 'unsafe'.

8.2 Methodology

There are many factors which contribute to the over-representation of younger drivers in the accident statistics. The complex nature of this problem suggests that the multi-method approach that has been adopted is essential in order to gain an insight into young car driver behaviour. Use of a single methodology might find important differences between less safe, younger drivers and safer, older drivers but it would be impossible to work out how much weight such differences could contribute to the overall picture. The similar findings between the data, collected through different research methods, adds weight to the current findings.

The methods were a series of developmental stages. The broader, quantitative methods adopted earlier enabled the later in-depth, qualitative analysis to concentrate on the most appropriate and relevant drivers.

In the first study, it was shown that self-reported violations were correlated with reported accident frequency, a finding supported by Reason *et al.* (1991), so it is suggested that this might be a reasonable method to assess the effectiveness of any campaigns designed to alter car driver attitudes. This would have the advantage of being easily administered and provide relatively quick feedback as to effectiveness.

As emphasised, much traffic safety research has ignored the potential explanatory significance of the social perspectives held by young drivers which implicitly suggests that adolescent perspectives are valued as being of limited consequence. Given the findings revealed above this has clearly been a mistake. An approach which accounts for behaviour in terms of 'imposed' or 'traditional' psychological variables (eg age and experience) might encourage stereotyping.

It is hoped that the in-depth methodology used has avoided this pitfall and has proved successful in helping to understand the detailed and complex issues involved in young male driving behaviour. The approach adopted helps to achieve such goals by seeking to understand the individuals as a whole and giving them time and the opportunity to provide their own accounts and explanations for their driving behaviour. Young drivers are, perhaps, best placed to explain the reasons why they drive the way they do. Practitioners have to recognise they do not know all the questions, let alone all the answers.

In order for traffic safety interventions to be successful, they have to have relevance to the target group. Use of research methods that have been adopted in these studies suggests that an understanding of driving from the young drivers' perspectives (and it is recognised that they do not all share the same perspective) is more likely to lead to successful measures.

An important implication from this work is the recognition that not all young drivers are part of one homogeneous group, there are large behavioural differences within age and sex groups. It is therefore misleading to write of a 'young driver problem' since the issue is about a *substantial* minority of 'young problem drivers'. Even the identification of 'unsafe' and 'safe' drivers within the same age group might be construed as stereotyping. It is important to mention that some of the 'safe' drivers reported 'unsafe' driving behaviour and vice versa. It is difficult to categorise drivers into clearcut groups and it is arguable that it is perhaps not desirable to do so. The young drivers in Study II were grouped into 'safe' and 'unsafe' driver groups in order to further our understanding of the young driver phenomenon. There is inevitably some overlap between the groups, often ignored by non-specialists, which should be taken into account (Ingham, 1986). However, it is self-defeating to regard every driver as a different individual with different needs and motives since it is then only possible to account for behaviour on an individual basis, which would not allow any generalisation to similar drivers involved in the wider phenomenon.

Young drivers are rational actors in their own lives. In order to fully understand their actions, we have to listen and take notice of what they see as important goals. Young drivers have to be understood and addressed through their own realities.

8.3 Implications

The data obtained from the route survey component of the study suggest that a substantial minority of younger drivers, particularly 17-20 year old males (but not all 17-20 year old males) does not possess the skills or, more likely, does not use them in as responsible a way as generally displayed in the other age and sex groups. Evidence for this was shown by the high number of speeding violations which were committed.

Attention on high risk drivers could focus on the possibility of targeted measures emphasising social factors. Passenger presence has been shown to affect driver behaviour, especially violations, reinforcing the view that attention should be given to some of the influential social aspects of car driving. It has been shown that passenger, and, in particular, peer group presence has a significant correlation with reported accident frequency. This effect is strongest for the youngest drivers (17-20 years). This may be because such drivers get positive feedback in terms of peer approval and esteem for driving dangerously. The obvious influence passengers have on driving behaviour and subsequent safe driving makes it necessary to include them in all countermeasures and preventive actions.

Results show that one-fifth of 17-20 year old driver journeys take place between the hours of 8pm to 4am. While there is no compulsory 'night time' driving component prior to obtaining a full licence, there are also social influences on night time driving such as drunken passengers that should be addressed.

The results obtained here have implications for future campaigns and educative measures suggesting that detailed group discussion programmes may prove to be effective in influencing driver behaviour. Young drivers should be actively encouraged to participate and make suggestions for these traffic safety initiatives. The complex nature of these issues is not readily amenable to large scale media campaigns which are uni-directional in nature. The social influence evident on car driving behaviour particularly with reference to passenger (and partner) effects, suggests that campaigns might be directed not just at drivers, but at some of these other influential groups who play an important part in affecting driver behaviour. The data show that those drivers who drive more safely in the presence of passengers do so because they do not wish to exhibit risky behaviour in the presence of someone who they believe would not respect such behaviour. It follows that drivers are less likely to be affected by publicity campaigns emphasising the dangers of risky driving than by campaigns which emphasise widespread social disapproval of risky driving behaviour, a point also made by Parker *et al.* (1992).

The influence of peer and parents' car driving behaviour should be acknowledged. Parents, in particular, should recognise that their own poor driving habits may be imitated and learnt by their children prior to their learning to drive. Parents should be encouraged to get involved in road safety projects. The extent of the effect that peer pressure has on driver behaviour suggests that attention could be paid to influencing not merely drivers, but peer and passenger attitudes. Methods whereby peers and passengers might 'negotiate' expectations of the driver and their subsequent driving behaviour might prove fruitful.

An understanding of people's perception of their own driving ability is essential since drivers are unlikely to pay attention to traffic safety campaigns if they consider that such campaigns are directed to <u>other</u> drivers in the population. As shown, the majority of young male drivers actually think they are 'safe' drivers. Media campaigns however, by their nature, are seen to be directed at 'unsafe' drivers. It follows that many of the young male drivers do not realise that the message applies to them. Media campaigns must therefore avoid ambiguous terminology. Examples where this was not done include the 'Stay low' drink driving message and the 'Take care' campaign.

Drivers should realise that the majority of people over-estimate their driving ability. Even those drivers who admitted to performing risky driving manoeuvres believed they were good drivers. This is because the definition of a 'good' driver was interpreted differently by different drivers. For the 'safe' drivers, a 'good' driver was a safe driver; on the other hand, for the 'unsafe' drivers a 'good' driver was a highly skilled driver. The difficulties with terminology in these areas should be addressed. For on-road driving a 'good' driver should be classified as a 'safe' driver.

Increasing levels of factual knowledge of accident statistics may have an adverse effect on driver behaviour, since many of the young drivers believed that accidents were far more frequent events than they actually are. Constant media emphasis on accident numbers may inadvertently reinforce drivers' perceptions of their 'above average' driving ability, especially if they have not yet had an accident themselves.

It would seem that many of the young drivers did not recognise the 'warning signs' that they were close to having an accident. A 'near miss' was not recognised as feedback that they were driving badly. This may be because it is easy to attribute a 'near miss' to the environment or other drivers. The most obvious feedback of poor driving is accident involvement. However, even after an accident it is easy to find causes other than one's own driving for the accident.

The young male drivers interviewed generally felt that accidents are chance events that occur at random. Obviously, accidents sometimes do occur at very low levels of risk and often they do not occur at very high levels of risk. This is a complication, but it must be emphasised that accidents are not chance or random events, and that inappropriate or incorrect driver behaviour does contribute to accident occurrence.

It would appear that young drivers seldom intend to drink and drive in advance. Many of those instances where a young male driver does drink and drive can be understood in terms of a 'rational' sequence of events. Often there are reasons which can be forwarded for drink driving such as the need to get home, lack of alternative transport and the apprehension about parental reaction. Such topics need to be addressed. Improved public transport could help provide alternatives to car use. Parents could be encouraged to pay for taxis when necessary and encourage their children in a number of ways. For example, a young driver who goes out for the evening with the intention to drive and not drink, may, by mistake, end up drinking too much. The two options available to that driver are (a) risk driving home or (b) leave the car at the pub/party and get home some other way. Option (a) is the most convenient assuming that the journey is completed safely and the parents are less likely to realise anything wrong since next morning the car will be outside the home. Option (b) however is obviously the one that should be encouraged. Therefore, parents who encounter situation (b) should not simply criticise their child since this is likely to reinforce the attractiveness of option (a) if/when the situation re-occurs. Instead, possibly parental encouragement that the correct option (b) was chosen may be the best strategy with little criticism attached. A constructive rather than critical approach is essential.

Many young drivers, particularly the 'unsafe' drivers regarded the car as an important element in their 'expressive' lives, and not just as a practical means of travelling from A to B. It is a difficult task to dissuade these youths from treating the car as such. Some of these aspects have been encouraged in certain supervised off-road probation schemes for young driving offenders, where harm is less likely to occur to either themselves or other people. However, careful monitoring and evaluation is essential in order to ascertain the efficacy of such approaches (Southampton Probation Service, 1987).

8.4 Training

Young people do not plan to have accidents, they do not want to have accidents and they do try to avoid them. Nevertheless, traffic accidents are by far the most common cause of accidental death for ages 5-34 years. Traffic behaviour should be incorporated in health behaviour programmes. These should not just be restricted to schools but other organisations as well. Better teaching resources should be available for young people and also for parents who wish to help their children in this vital aspect of their lives.

Many parallels can be made with another health related issue - that of sex education. It is increasingly apparent that teaching the physical facts is not enough. The discussion of wider social issues such as relationships and negotiation skills is becoming increasingly adopted. Similarly, young male drivers could be encouraged, perhaps through the use of role play in such discussions, to explore other perspectives whereby they can realise that their driving behaviour is viewed as risky by other drivers, and that their own 'skills' might not be sufficient to prevent accidents in all cases.

A systematic long term road safety education programme starting at a very early age should be devised which would help with the development of appropriate understanding of the driving phenomenon and help mould attitude and behaviour over time. Trials should be instituted to develop and evaluate this 'social programme' approach.

The studies clearly show the need to influence attitudes and social norms and try to provide greater perceived social support for 'safer' driving behaviour. It is likely that educational programmes involving sessions in small groups (for all pre-learner drivers in schools as well as later for convicted drivers) might prove more effective than campaigns that merely increase knowledge levels or involve 'shock' advertising tactics. Through this method many of the important social aspects and influences of car driving behaviour coming out of this study could be focused on; such factors are largely ignored within the current methods of driver training which concentrate on 'driving skills.'

Driving should not be viewed as merely a physical skill. It is arguable that the young may be the most physically skilled drivers in terms of better reactions, eyesight and so on, but these possible physical advantages are not reflected in their accident records. All too clearly, 'unsafe' drivers are aware of the risks they take but, because they believe themselves to be highly skilled, they regard themselves as 'safe' drivers.

Concentrating greater resources and more emphasis on the physical skill aspects of driving whilst ignoring the attitudinal and social influences is likely to have minimal impact. Pre-licence training on road safety should not solely concentrate on learning the skills to drive but incorporate much wider issues such as parental and peer influences, over-estimation of driving ability, the effects of drinking and social influences such as passenger, music and mood effects. These are important and often neglected issues which may be beyond the immediate control of many young drivers due to a lack of understanding. Recognition and awareness of these factors and ways of resisting such influences could be encouraged and explored.

For a number of drivers it is not that they are incapable of driving safely, it is that they choose not to do so. Within The Highway Code there are the formal rules of the road and recommended guidelines for road user behaviour. Consideration should be given to the inclusion of a section within The Highway Code pointing out some of the problems for road users. If car drivers were made more aware of the possible social influences on driving detailed above perhaps including the dangers of particular types of roads, the vulnerability of certain road users and the most dangerous times of day for driving, then it is likely that <u>some</u> drivers (who choose to) might adapt their driving behaviour accordingly.

It is further suggested that more formal driver education programmes should make people aware of the potential effect on driving behaviour of a number of social influences identified in this (and other) studies. Based on Gergen's (1973) notion of 'enlightenment' effect, it is suggested that such research can *'enlighten one as to the range of factors potentially influencing behaviour under various conditions'* (p.317) and, in turn, that many drivers could protect themselves against the potentially dangerous effect of some of the influences.

It may be possible for drivers to gain status and reputation through schemes which can show what a skilled and safe driver someone is without the same degree of risk being involved. Large companies with a specific interest in transport safety, such as insurance companies, might be willing to fund such schemes. Drivers who successfully complete a course could be awarded special individualised number plates to show they had ascertained a particular level of expertise. Schemes could be run by ex-police drivers who, it is shown, are widely respected as 'good' drivers by the majority of young male drivers. Again, however, monitoring of any such schemes is vital.

Greater knowledge of passenger effects on driving is not solely concerned with developing a greater theoretical psychological knowledge of driving behaviour. There are important practical implications that can be addressed with special relevance for high risk young drivers. Driver training or rectification schemes could explore such social issues in order to make drivers and passengers aware of the effects. Drivers could be taught how to handle and respond to peer pressures, whilst passengers could be made aware of ways to negotiate the social situation to make the driving experience safer. It might also be emphasised how important it is for young people to plan what they intend to do for an evening and how they intend to travel during the course of an evening. Much drink driving behaviour was caused by a lack of forward planning showing how important the (contingency) planning stage, including scenarios such as being 'let down' by friends, can be. Creative solutions such as these, although not providing the whole answer to unsafe driving amongst some young drivers, can only be developed after an in-depth understanding of young driver behaviour is accomplished.

8.5 Policy

Certain technical measures could be introduced to influence those drivers, especially the young, who possess the necessary skills to drive 'safely' but choose not to. An increase in the likelihood of detecting driver violations should influence behaviour. The finding that the driver violation action of crossing red lights was significantly correlated to reported accident frequency suggests that measures to reduce this type of behaviour such as the use of video cameras should be more widely implemented (Lawson, 1991).

The fact that speeding UDAs comprised 90% of all dangerous errors for all age groups and that dangerous UDAs were found to be correlated to reported accident frequency suggests that the problem of drivers' speeding, particularly on urban, residential roads, should be given attention. Whether this could best be done by further enforced legislative measures, by greater traffic calming programmes or by educative means remains open to question.

Car radio cassettes should be as automatic as possible requiring little manual effort. If possible, they should be mounted high on the dashboard, level with the driver's hand position on the steering wheel. Some new cars already have radio cassette operations built into the steering wheel. Consideration should be given to an information leaflet pointing out the potential effects (both positive and negative) of listening to a radio cassette whilst driving supplied with each new car or radio cassette operating instructions. This could include some discussion of the potentially distracting effects of loud music.

Media portrayal of the car is recognised as unrealistic by virtually all young male drivers. Media portrayal often emphasises speed and risk-taking as glamorous. The 'expressive' nature of cars is emphasised in advertisements beyond the 'practical' activity. Whilst the content of fictional material is difficult to control, greater attention needs to be given to the possibly negative effects of car advertising which emphasises performance above safety and reliability.

The studies found no correlation between reported level of drink-driving violations and reported accident frequency. This result is difficult to explain but may reflect a gradual shift in attitude amongst the younger drivers towards the unacceptability of drink-driving and, possibly as a result of this, a reluctance to admit levels of drink-driving as has been found in earlier studies.

The pressures on young people to drink suggests that low or non- alcohol drinks should be more widely available and cheaper than alcoholic beverages, thus encouraging greater patronage. Improved public transport, particularly late at night, might also help to provide young people with a greater number of methods to get home from an evening out, thus limiting the need to drink and drive and pre-empting the excuse that it was difficult to get home by other means. It is accepted that such initiatives would be extremely expensive to operate, but these costs have to be measured against the £742,840 estimated cost of each fatality accident in 1990 (Department of Transport, 1991).

Insurance companies might be encouraged to give rebates for accident-free driving periods particularly among the younger drivers who get penalised with high insurance premiums due to the actions of an 'unsafe' minority. Similarly, large companies could give awards for company drivers who have an accident-free period of driving, thus giving a positive incentive to drive safely. Incentive programmes such as these which act as a reward or merit system would help to balance out or act as an alternative to, the current 'de-merit' system in operation.

It is vitally important that policy initiators or policy devising bodies take notice of and incorporate research findings into practical outcomes.

6.6 Future research

The concentration of researchers on external variables such as age and experience tends to falsely suggest that 'unsafe' driving behaviour amongst young drivers is a natural phenomenon determined by unalterable fixed processes. It suggests a young driver problem, when it is perhaps more correct to talk about young problem drivers. The old perspectives and concepts have to be re-examined in a new light. It is essential to go beyond what is easily observable and explore the reality of car driving behaviour. Researchers must accrue knowledge of the motivations, needs and other psychological mechanisms that contribute to unsafe driving behaviour. In order to do this, there must be a move from a depersonalised stance when examining personal behaviour such as car driving, to a different social perspective which is both personal and relevant to young car drivers.

Future research could look at the possibilities of other activities which might help to take the place of driving as a status enhancing activity. Such activities could give youths the chance to gain reputations in other fields whether this be through organised sports, driving simulators, video games or off-road supervised driving, in the hope that this will provide thrill seeking at the same time as lessening the actual risk of an injury. A probation scheme for persistent young car offenders which involves off-road driving as an alternative to custody is the 'On the right road' course run by Birmingham Probation Service. Constant evaluation as to the effectiveness of any such schemes is essential to determine whether the schemes 'whet' appetites or help prevent future unsafe on-road driving.

Klein (1976) argued that media effects on driving behaviour may be far more important than the huge amount of work which has investigated the role of mass media in stimulating violent behaviour. His comment that very little work has been done is still as relevant today, some 16 years later (see also Evans, 1991). Indeed, two of Klein's central questions *'What are the effects (- and on what population -) of the car chases that have become an almost inevitable part of the television drama?'* and *'How do individuals respond to this kind of entertainment, and how do their various responses relate to their crash and violation frequencies?'* (p.217) remain relatively unanswered and unexplored.

It must be emphasised that this study found that a substantial minority of young drivers could be classified as 'unsafe' drivers. The results therefore, do not lend support to 'blanket' legislation or other remedial measures that would unjustifiably penalise all young drivers.

Many of the issues identified in this thesis are not easy to address. Legislation and engineering improvements can go so far, but cannot, on their own, directly affect attitudes. Greater attention should be given to programmes for education and attitude change which incorporate the social aspects and influences on car driving behaviour. Benefit will be gained from the opportunity for young people to explore and discuss these social aspects of driving in a constructive and encouraging environment through, for example, health education or personal development classes in schools and colleges, as well as during driver training. These are likely to prove to be effective in reducing car driver casualties amongst younger drivers. For persistent offenders or accident involved drivers, attention should be given to constructive rectification schemes, rather than merely to stiffer penalties and greater skills training and assessment. The aim must be to create a social environment whereby driving with responsibility and consideration becomes the norm, rather than the current situation in which many young drivers use risky driving as a way to acquire and enhance their reputations.

Young driver behaviour is an extremely complex, multi-dimensional phenomenon. There is no ready, single answer to all the questions which arise. It is dangerous to try to produce solutions without a detailed understanding which should ensure that all methods and approaches are explored including legal (incorporating individual rights and freedoms), incentive, educational and social/behavioural approaches. Evaluation of any proposed countermeasures is essential and, if possible, specific groups of young drivers should be involved in devising any processes that are designed to help them.

Further work on the establishment and evaluation of schemes which concentrate on the social aspects of driving is justified on the basis of this (and other) research. Such schemes would appear to provide the best prospect for furthering our understanding of young driver behaviour and, in the long term, lead to improved counter-measures and hence fewer accidents. The well-documented, complex nature of the young driver phenomenon should not be used as an excuse by policy makers for inaction.

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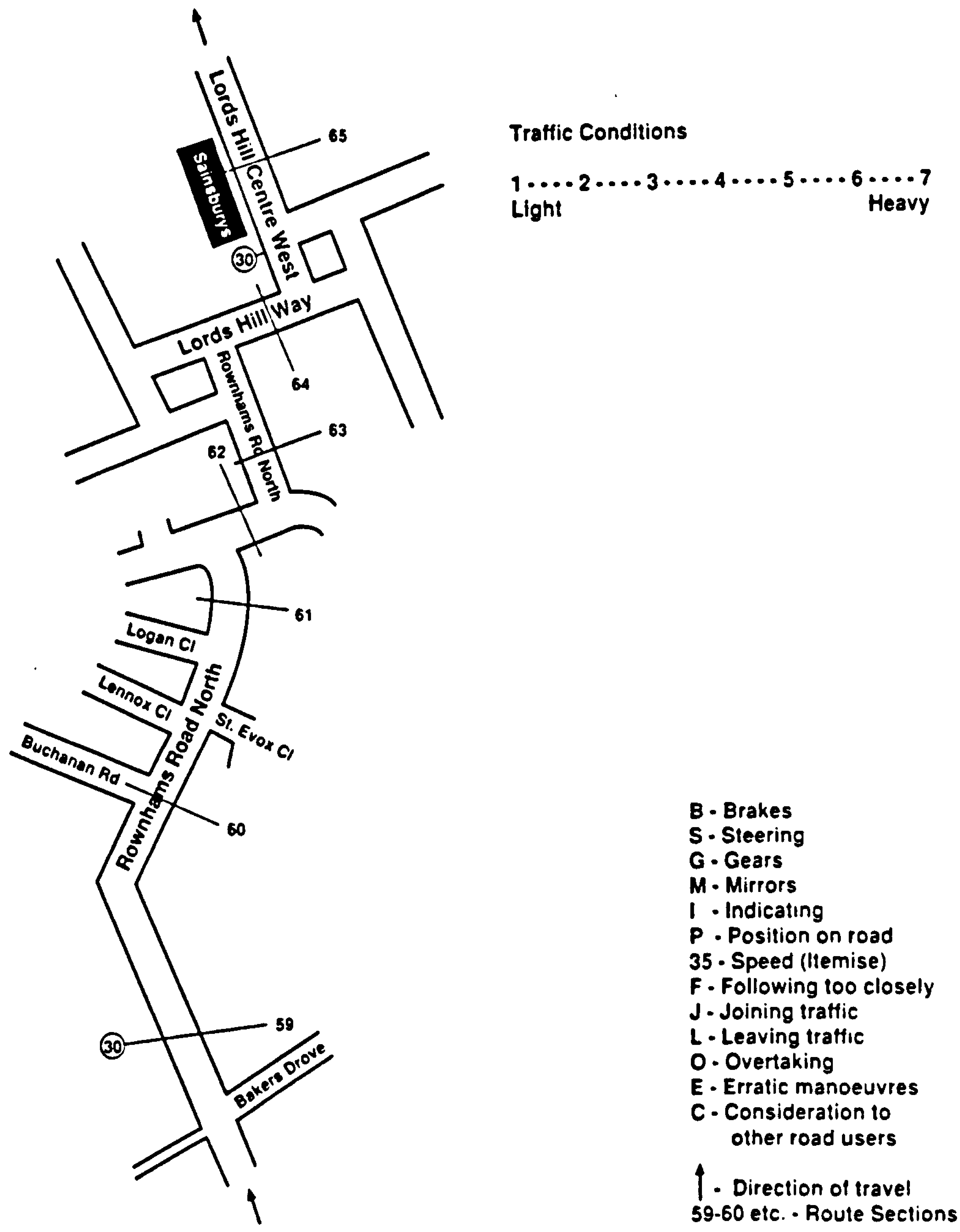
APPENDIX

A.1 Route assessment marking procedure

Sections 59-64 from route survey assessment sheets (118 sections in total) to illustrate route assessment marking procedure. Observers were instructed to mark UDAs by the driver as they occurred on the route using the UDA category key. All UDAs classified as dangerous (see Appendix A.2.1) were circled.

Any UDAs that could not be described using the UDA marking procedure were written in full on the map. Traffic conditions were noted on the route.



A.2 Glossary of terms

A.2.1 Definitions of UDAs (Unsafe Driver Actions)

Definition of a driver UDA *:*
"any action or lack of action on the part of the driver that increased their risk or potential risk of an accident".

Definition of a dangerous driver UDA *:*
"a driver UDA (see above) involving particular liability or exposure to harm".

B-Braking
Incorrect use of brakes which increased accident risk eg. late braking.

S-Steering
Incorrect steering or positioning of hands on wheel such that the subject would be less able to react to any given traffic situation.

G-Gears
Incorrect choice or use of gears that could result in an unsafe situation occurring.

M-Mirrors
Involved failure to use rear observation when it was necessary to take account or be aware of following road users. For example, changing lanes into the path of an overtaking vehicle that had to slow or swerve. Also the result of looking over the shoulder for an excessive length of time and not adequately taking account of the traffic situation ahead at the time.

I-Indicating
Misleading or failing to warn other road users of actions at appropriate time.

P-Position on road
When the correct position on the road was not adopted. Examples would include straddling lanes, driving too near the kerb or centre of the road.

35-Speed (itemised)
Driving at a speed that was inappropriately high for the road, traffic or environmental conditions at the time regardless of posted speed limits.

F-Following too closely
With reference to factors such as traffic conditions, road surface and type of vehicle being followed.

J-Joining traffic
Involved pulling out of the minor road when there was not a safe gap in the major road traffic. This type of Unsafe Driver Action (UDA) could occur after the subject had stopped at the Give Way or Stop line, or if they emerged without stopping.

L-Leaving traffic
Involved exiting from a road when it was unsafe to do so. This type of UDA mainly applied to right turn manoeuvres when the subject had to cross on-coming traffic.

A.2.1 Definitions of UDAs (Unsafe Driver Actions) (cont'd)

O-Overtaking
Involved overtaking other vehicles or passing parked vehicles in an unsafe manner. Examples would include passing cars in the face of oncoming traffic, forcing on past parked cars causing approaching cars, with right of way, to brake or swerve, overtaking in an illegal situation or too close to be safe.

E-Erratic manoeuvres
When for no apparent reason the driver carried out a manoeuvre, such as changing lanes, much too quickly for it to be safe.

C-Consideration to other road users
Involved not taking account of the needs or abilities of other road users including cyclists, pedestrians (particularly children), horse riders and so on.

If any driver action (as above) was considered to be particularly dangerous the letter or itemised speed was placed in a circle.

A.2.2 Definitions of driver ratings

Ability
The overall ability of the driver to deal with any task or hazard which presents itself.

Safety
The margins of safety that the driver displays to enable the vehicle to be positioned on the road with the minimum risk to themselves and other road users.

Anticipation
The continual assessment by the driver to correctly anticipate other road users' actions to allow uninterrupted flow and time to deal with situations.

Concentration
The application of mind and body to a particular endeavour (driving) to the complete exclusion of everything not relevant to that endeavour.

Observation
The ability of the driver to look into the correct areas thus enabling themselves to complete an unflourished drive.

Technical skills of car control
The skills displayed by the driver relating to the smoothness and correct use of all the vehicle controls.

A.3 Post route questionnaire

1 How do you think you drove on the route survey?

1 - - - - - - - 2 - - - - - - - 3 - - - - - - - 4 - - - - - - - 5 - - - - - - - 6 - - - - - - - 7

Very Badly	**Very Well**

2 How safely do you think you drove on the route?

1 - - - - - - - 2 - - - - - - - 3 - - - - - - - 4 - - - - - - - 5 - - - - - - - 6 - - - - - - - 7

Very Unsafely	**Very Safely**

3 What do you think your level of anticipation was like on the route?

1 - - - - - - - 2 - - - - - - - 3 - - - - - - - 4 - - - - - - - 5 - - - - - - - 6 - - - - - - - 7

Very Bad	**Very Good**

4 What do you think your level of concentration was like on the route?

1 - - - - - - - 2 - - - - - - - 3 - - - - - - - 4 - - - - - - - 5 - - - - - - - 6 - - - - - - - 7

Very Bad	**Very Good**

5 What do you think your level of observation skills was like on the route?

1 - - - - - - - 2 - - - - - - - 3 - - - - - - - 4 - - - - - - - 5 - - - - - - - 6 - - - - - - - 7

Very Bad	**Very Good**

6 What do you think your technical skills of car control were like on the route?

1 - - - - - - - 2 - - - - - - - 3 - - - - - - - 4 - - - - - - - 5 - - - - - - - 6 - - - - - - - 7

Very Bad	**Very Good**

7 What speed did you drive at on the route compared to "normal"?

1 - - - - - - - 2 - - - - - - - 3 - - - - - - - 4 - - - - - - - 5 - - - - - - - 6 - - - - - - - 7

Very much slower	**Very much faster**

8 How did you find the route?

1 - - - - - - - 2 - - - - - - - 3 - - - - - - - 4 - - - - - - - 5 - - - - - - - 6 - - - - - - - 7

Very Difficult	**Very Easy**

9 Which sections of the route had you previously driven?

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A.3 Post route questionnaire (cont'd)

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10 Do you think the drive gave a fair indication of your "normal" driving?

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11 Did the observer's presence affect your driving? In what way(s)?

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12 Did the task you were given affect your driving? In what way(s)?

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13 Have you any other comments about the route or the drive etc?

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DRIVER DIARY

Instructions

This is your driver diary and in it we would like you to record details of every journey that you make as the driver in the next two weeks.

A 'journey' in this study will be taken to be any trip in the car of whatever distance which involves the car stopping for a specific purpose other than that dictated by traffic conditions, eg. a traffic jam. Using this definition, a trip to drop off your partner at work and then returning home would count as two journeys, even if the engine was not switched off between arriving at the workplace and departure. If you are ever unsure of the definition it is best to enter trips as separate journeys rather than combine them.

Try to fill in the diary immediately after completing each journey whilst it is still fresh in the memory. We recommend you leave the diary in the car and fill it in there. Each journey should not take longer than two or three minutes to fill in.

If you forget to fill in the journey and subsequently remember it, fill it in as soon as possible but make a note that it was filled in at a later date.

In the box below, you should fill in details of each car that you drive in the next two weeks. These will then be called Car 1, Car 2 and so on. This will save you time by allowing you to place the appropriate number of the vehicle that you were driving in the box in each column of the driver diary.

NAME : ....

Details of car(s) that you drive:

	Car 1	Car 2	Car 3	Car 4
Make and Model				
Engine Size				
Year of Manufacture				
Car owned by...				
Number of miles on mileometer				

The following list describes how each question should be answered:

Question Number:

1	Journey:	Fill in the number of the journey. ie1 for first, 2 for 2nd and so on.
2	Car Number:	Fill in the number of the car being used. This number refers to the box on the previous page concerned with details of the car(s) that you drive. If you only ever drive one car, then you should always place the number 1 in this box.
3	Date:	Fill in the date that your journey took place.
4	Start of journey:	Fill in the time that your journey started.
5	Weather conditions:	Describe what the weather conditions were like on the journey. eg dry, sunny wet etc. Use whatever terms you feel are most appropriate.
6	Lighting conditions:	Describe the light conditions on the journey. eg night,dusk or daylight.
7	From?	This refers to the place where the journey started. eg work, shops
8	To?	This refers to the place where the journey ended. eg home, pub
9	Time to complete journey:	Fill in how long the journey took in hours and minutes.

10	Distance of journey:	Fill in the number of miles of the journey. It is easiest to take a reading from the mileometer but otherwise an estimate will do.
11	Purpose of journey:	Fill in the reason for making the journey. eg food shopping, visiting relatives, going to work etc
12	Passenger details:	For each passenger give their sex (M or F), their age (estimate if unknown) and their relationship to you. eg M/24/Brother, F/26/Friend.
13	What were you doing prior to the journey?	Fill in what you were doing before starting the journey eg working, drinking etc
14	Did anything significant happen prior to the journey? eg an argument, good news.	Fill this in only if an incident occurs which subsequently affects either the journey itself or your mood during the journey.
15	Had you driven the route before? If yes, how often?	Fill in how frequently you have driven the route eg twice a day, once a month, once before, never etc
16	Was the radio/ cassette on?	Answer yes or no. If yes answer Q17 if no move on to Q18
17	What were you listening to? eg music/ conversation etc.	Fill in whether you were listening to music or conservation etc or a mixture of both.

Questions 18 and 19 refer to your perceptions and feelings of each journey that you make. Please decide your level of feeling from the 7 point scale below and enter the number of your choice in the space provided in the appropriate column corresponding to the number of the journey. For example, if on a particular journey you find you are very tired (Q19b) then you should enter a 6 or 7 in the box dependent on your level of tiredness. However, if you are only quite tired then you should enter a 3, 4 or 5 dependent on the level of your tiredness and similarly if you are not at all tired then you should enter either a 1 or 2 in the box. The same rating method should be used for all the terms in questions 18 to 19.

1———2———3———4———5———6———7
Not at all ... Extremely

18 The journey was	a. Risky due to road conditions	To what degree was the journey risky due to road conditions?
	b. Enjoyable	To what degree did you enjoy the drive?
19 On the journey I felt I was	a. Hurried	To what degree did you feel you were hurried on the journey?
	b. Tense	To what degree did you feel you were tense on the journey?
	c. Tired	To what degree did you feel you were tired on the journey?
	d. Able to concentrate	To what degree on the journey did you feel able to concentrate due to fatigue or passenger distractions? etc
20 Additional notes on each journey (if applicable)		Fill in any other details to do with your driving and/or the journey which in your opinion were significant factors on the drive eg heavy traffic etc

DRIVER DIARY

Instructions: Fill in a new column for each journey that you make. Try to write as clearly as possible in the boxes provided.

1	Journey						
2	Car Number						
3	Date						
4	Start of journey						
5	Weather Conditions						
6	Lighting Conditions						
7	From?						
8	To?						
9	Time to complete journey						
10	Distance of journey						
11	Purpose of journey						
12	Passenger details (Give ages, sex and relationship to you)						
13	What were you doing prior to the journey?						
14	Had anything significant happened prior to the journey? eg an argument, good news etc.						
15	Had you driven the route before? If yes, how frequently?						
16	Was the radio/cassette on?						
17	What were you listening to? eg music/conversation etc						

For Questions 18 and 19, please decide your level of feeling from the 7 point scale and enter the number of your choice in the box provided in the appropriate column. (see notes on page 4 of the instructions)

1------2------3------4------5------6------7

Not at all **Extremely**

18	The journey was:	a. Risky due to road conditions						
		b. Enjoyable						
19	On the journey I felt I was:	a. Hurried						
		b. Tense						
		c. Tired						
		d. Able to concentrate						
20	Additional notes on each journey (if applicable)							

Appendix A.5 Driving Styles Questionnaire

DRIVING STYLES QUESTIONNAIRE

Instructions

This questionnaire is concerned with car driver behaviour.

Please read the questions carefully and answer them as truthfully as you can. Since the replies will be completely confidential, we would like you to answer the questions (especially those in Section E) according to how you **do** drive, rather than how you think you **should** drive (these may or may not be the same thing)!

In some cases you are required to put a tick in the appropriate box and in some cases to enter a number in a box. For the questions which involve a seven-point scale, please circle the number which best describes how you wish to answer the question.

For example:

1----2----3----4----5----6----7
Never **All the time**

With some questions you are asked to add comments – please use these fully and continue overleaf on a separate sheet if necessary.

Very many thanks for your help.

DRIVING STYLES QUESTIONNAIRE

Answer the following questions as truthfully as possible.

Part A: Background information

1 Age: 17-20 ☐ 21-25 ☐ 26-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 60+ ☐

2 Sex: Male ☐ Female ☐

3 Marital Status: Single ☐ Married/ Co-habiting ☐ Widowed/Separated/Divorced ☐

4 Occupation? ....

....

5 How many children do you have (if any)? ....

If so, how old are they? ....

	Month	Year
6 When did you start driving (approximately)?	☐	☐
7 When did you pass your test (approximately)?	☐	☐

8a Estimate the number of miles you have driven in each of the following years?

	Miles
1985	☐
1986	☐
1987	☐
1988	☐
1989	☐

8b Estimate the total number of miles driven in your driving career? ☐
(If over 50,000 miles, just tick the box.)

9 Who owns the car that you usually drive? (Please tick one)

Yourself	☐	Employer	☐
Parents	☐	Friend	☐
Other relative	☐	Boy/girlfriend	☐
Husband/wife/partner	☐	Other	☐

10 Details of the car that you usually drive:

Make and model ☐

Engine size (cc) ☐

Year of manufacture ☐

11 Please indicate the general purposes of your journeys over an average week in terms of percentage of time spent driving your car – these should add up to 100%; (eg, to and from work – 50%; leisure – 35%; shopping – 15%)

to and from work	[ ] %	
as part of job	[ ] %	
shopping	[ ] %	
leisure: eg visiting friends, pubs, cinema, sport etc.	[ ] %	
other	[ ] %	Please specify ....

12 Please indicate the proportions of your driving time when you are alone and when you have passengers with you. These should add up to 100%. (eg, driving alone for 70% of time, accompanied by partner/spouse for 15% and with friends for 15% of time).

alone	[ ] %	
partner/spouse	[ ] %	
children only	[ ] %	
partner/spouse **and** children	[ ] %	
friends	[ ] %	
other	[ ] %	Please specify ....

Part B: Learning to drive

13	Did you ever drive illegally on the road before obtaining your provisional licence?	Yes	[ ]
		No	[ ]
14a	Did you have professional driving lessons?	Yes	[ ]
		No	[ ]
14b	If Yes, how many lessons did you have before passing your test?	Number	[ ]
15	How many tests did you take to pass?	Number	[ ]

16 Do you think the driving test is an adequate test for drivers? (Please circle appropriate number)

1----2----3----4----5----6----7
Not at all adequate ... **Completely adequate**

17 Are there any ways that you think the test might be improved?

....

....

....

....

18 What was the **main** motivation for you to learn to drive?

....

....

....

19a Do you still drive in the same way as on your test?

Yes ☐
No ☐

19b If No, how does it differ?

....
....
....

Part C: Car choice

20a How important to you is the type of car that you drive?

1----2----3----4----5----6----7
Not at all important ... **Extremely important**

20b If appropriate, in what way(s) is it important?

....
....
....

21 How important are the following qualities to you when buying a car?

a	Speed	**Not at all important**	**1----2----3----4----5----6----7**	**Extremely important**
b	Acceleration	**Not at all important**	**1----2----3----4----5----6----7**	**Extremely important**
c	Engine size	**Not at all important**	**1----2----3----4----5----6----7**	**Extremely important**
d	Comfort	**Not at all important**	**1----2----3----4----5----6----7**	**Extremely important**
e	Price	**Not at all important**	**1----2----3----4----5----6----7**	**Extremely important**
f	Reliability	**Not at all important**	**1----2----3----4----5----6----7**	**Extremely important**
g	Safety	**Not at all important**	**1----2----3----4----5----6----7**	**Extremely important**
h	Utility/Functional	**Not at all important**	**1----2----3----4----5----6----7**	**Extremely important**
i	Appearance	**Not at all important**	**1----2----3----4----5----6----7**	**Extremely important**
j	Other (Specify)	**Not at all important**	**1----2----3----4----5----6----7**	**Extremely important**

22 Which was the main factor when buying your current car? (if applicable) ....

23 Which car would you like to own? Car: ....

Why? ....

....
....

Part D: Passenger/Radio presence

24a Does having passengers in the car affect you driving style?

1----2----3----4----5----6----7
Not at all … **A lot**

24b If appropriate, which type of passengers affect your driving and in what ways?

	Type of Passenger	Effect?
For example . . .	Parent	Drive slower
	....	....
	....	....
	....	....
	....	....
	....	....
	....	....

24c Have you any other comments concerning possible effects of passenger presence on driving?

....
....
....
....
....
....

25 How often do you listen to a radio/cassette whilst driving?

1----2----3----4----5----6----7
Never … **All the time**

26 What do you most often listen to?

- Pop music ☐
- Classical ☐
- Pop radio ☐
- Conversational radio ☐

27a Does listening to the car radio/cassette affect your driving in any way?

1----2----3----4----5----6----7
Not at all … **A lot**

27b If appropriate, in what way(s)?

....
....
....
....
....
....

Part E: Perceptions of driving situations

28 In general, how dangerous do you find the following types of roads?

a	Motorways	Not at all dangerous	1----2----3----4----5----6----7	Extremely dangerous
b	Dual carriageways	Not at all dangerous	1----2----3----4----5----6----7	Extremely dangerous
c	Rural roads (60mph)	Not at all dangerous	1----2----3----4----5----6----7	Extremely dangerous
d	Urban roads (30mph)	Not at all dangerous	1----2----3----4----5----6----7	Extremely dangerous

29 In general, how dangerous do you find the following road situations?

a	Roundabouts	Not at all dangerous	1----2----3----4----5----6----7	Extremely dangerous
b	Joining a motorway	Not at all dangerous	1----2----3----4----5----6----7	Extremely dangerous
c	Right turns	Not at all dangerous	1----2----3----4----5----6----7	Extremely dangerous
d	Left turns	Not at all dangerous	1----2----3----4----5----6----7	Extremely dangerous
e	Traffic lights	Not at all dangerous	1----2----3----4----5----6----7	Extremely dangerous

30 How frequently do you perform the following driving actions?

a	Attempt to drive away from stationary in wrong gear.	Never	1----2----3----4----5----6----7	All the time
b	Deliberately park on a double yellow line.	Never	1----2----3----4----5----6----7	All the time
c	Forget that your lights are on full beam.	Never	1----2----3----4----5----6----7	All the time
d	Become impatient with a slow driver in the outer lane and overtake on the inside.	Never	1----2----3----4----5----6----7	All the time
e	Misjudge a gap in a car park and nearly (or actually) hit an adjacent vehicle.	Never	1----2----3----4----5----6----7	All the time
f	Deliberately disregard speed limits late at night or early in the morning.	Never	1----2----3----4----5----6----7	All the time

g	Intend to switch on the windscreen wipers, but switch on the lights instead or vice versa.	1----2----3----4----5----6----7 Never ... All the time
h	Take a chance and cross on traffic lights that have just turned red.	1----2----3----4----5----6----7 Never ... All the time
i	Forget which gear you are in and have to check with your hand?	1----2----3----4----5----6----7 Never ... All the time
j	"Race" oncoming vehicles for a one-car gap on a narrow or obstructed road.	1----2----3----4----5----6----7 Never ... All the time
k	Misjudge speed of oncoming vehicle when overtaking.	1----2----3----4----5----6----7 Never ... All the time
l	Drive when you realise you may be over the blood alcohol limit.	1----2----3----4----5----6----7 Never ... All the time

How frequently do you perform the following driver actions?

m	Get involved in unofficial "races" with other drivers.	1----2----3----4----5----6----7 Never ... All the time
n	Miss your exit on a motorway and have to make a lengthy detour.	1----2----3----4----5----6----7 Never ... All the time

31a How many car accidents had you have whilst driving? ☐

b How many of these accidents were, to any extent, your fault? ☐

32a Have you any convictions for motoring offences?
(*delete as appropriate) *Yes/No

b What were the details? ....

....

....

....

....

Thank you again for your time and co-operation.

Appendix A.6: Statistical Tables

Analysis of Variance for Steering UDAs

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	6897.7195	3	2299.2398	3.867	.0095
Sex	1090.7648	1	1090.7648	1.835	.1763
Age	6169.6054	2	3084.8027	5.189	.0059
2-FACTOR INTERACTION	3918.7275	2	1959.3637	3.296	.0380
Sex Age	3918.7275	2	1959.3637	3.296	.0380
RESIDUAL	252078.72	424	594.52527		
TOTAL (CORR.)	262895.16	429			

0 missing values have been excluded.
Effects: Sex p>0.05 NS
Age p<0.01
Sex/Age P<0.05

Analysis of Variance for Speeding UDAs

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	5619.5778	3	1873.1926	7.414	.0010
Sex	19.029100	1	19.029100	.0750	.7868
Age	5507.3804	2	2753.6902	10.898	.0000
2-FACTOR INTERACTION	526.95093	2	263.47546	1.043	.3535
Sex Age	526.95093	2	263.47546	1.043	.3535
RESIDUAL	107132.75	424	252.67158		
TOTAL (CORR.)	113279.28	429			

0 missing values have been excluded.
Effects: Sex p>0.05 NS
Age p<0.01
Sex/Age P>0.05 NS

Analysis of Variance for Mirror UDAs

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	1431.4584	3	477.15279	2.662	.0476
Sex	109.95640	1	109.95644	.6140	.4423
Age	1279.9117	2	639.95583	3.571	.0290
2-FACTOR INTERACTION	328.40468	2	164.20234	.9160	.4008
Sex Age	328.40468	2	164.20234	.9160	.4008
RESIDUAL	75986.297	424	179.21297		
TOTAL (CORR.)	7746.1608	429			

0 missing values have been excluded.
Effects: Sex p>0.05 NS
Age p<0.05
Sex/Age P>0.05 NS

Appendix A.6: Statistical Tables (cont'd)

Analysis of Variance for Position on Road UDAs

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	54.982853	3	18.327618	.2630	.8517
Sex	10.569394	1	10.569394	.1520	.7010
Age	46.621697	2	23.310848	.3350	.7154
2-FACTOR INTERACTION	.31212750	2	.15606380	.0020	.9978
Sex Age	.31212750	2	.15606380	.0020	.9978
RESIDUAL	29493.610	424	69.560400		
TOTAL (CORR.)	29548.905	429			

0 missing values have been excluded.
Effects: Sex p>0.05 NS
Age p>0.05 NS
Sex/Age P>0.05 NS

Analysis of Variance for Total UDAs

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	44741.686	3	14913.895	5.622	.0009
Sex	6690.2910	1	6690.2910	2.522	.1130
Age	40291.754	2	20145.877	7.594	.0006
2-FACTOR INTERACTION	19063.016	2	9531.5081	3.593	.0284
Sex Age	19063.016	2	9531.5081	3.593	.0284
RESIDUAL	1124840.7	424	2652.9263		
TOTAL (CORR.)	1188645.4	429			

0 missing values have been excluded.
Effects: Sex p>0.05 NS
Age p<0.01
Sex/Age p<0.05

Analysis of Variance for Total Dangerous UDAs

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	3274.2146	3	1091.4049	4.827	.0026
Sex	125.76250	1	125.76250	.5560	.4642
Age	2994.6069	2	1497.3034	6.622	.0015
2-FACTOR INTERACTION	184.45984	2	92.229922	.4080	.6653
Sex Age	184.45984	2	92.229922	.4080	.6653
RESIDUAL	95874.916	424	226.12009		
TOTAL (CORR.)	99333.591	429			

0 missing values have been excluded.
Effects: Sex p>0.05 NS
Age p<0.05
Sex/Age p>0.05 NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Observed Ability; Males (17 - 20)

Sample 2: Observed Ability; Males (21 - 25)

Test based on: Pairs

Average rank of first group = 68.4824 based on 85 values.
Average rank of second group = 94.12 based on 75 values.
Large sample test statistic Z = 3.56476
Two-tailed probability of equaling or exceeding Z = 3.64267E-4

NOTE: 160 total observations.

$p < 0.01$

Comparison of Two Samples (Mann-Whitney)

Sample 1: Observed Ability; Males (21 - 25)

Sample 2: Observed Ability; Males (31 - 40)

Test based on: Pairs

Average rank of first group = 72.52 based on 75 values.
Average rank of second group = 82.2278 based on 79 values.
Large sample test statistic Z = 1.38595
Two-tailed probability of equaling or exceeding Z = 0.165763

NOTE: 154 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Observed Ability; Males (17 - 20)

Sample 2: Observed Ability; Males (31 - 40)

Test based on: Pairs

Average rank of first group = 66.7294 based on 85 values.
Average rank of second group = 99.4684 based on 79 values.
Large sample test statistic Z = 4.48771
Two-tailed probability of equaling or exceeding Z = 7.20575E-6

NOTE: 164 total observations.

$p < 0.01$

Comparison of Two Samples (Mann-Whitney)

Sample 1: Observed Ability; Females (17 - 20)

Sample 2: Observed Ability; Females (21 - 25)

Test based on: Pairs

Average rank of first group = 54.7167 based on 60 values.
Average rank of second group = 54.2292 based on 48 values.
Large sample test statistic Z = -0.0791697
Two-tailed probability of equaling or exceeding Z = 0.936892

NOTE: 108 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Observed Ability; Females (21 - 25)

Sample 2: Observed Ability; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 59.5729 based on 48 values.
Average rank of second group = 68.216 based on 81 values.
Large sample test statistic Z = 1.30188
Two-tailed probability of equaling or exceeding Z = 0.192958

NOTE: 129 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Observed Ability; Females (17 - 20)

Sample 2: Observed Ability; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 66.2833 based on 60 values.
Average rank of second group = 74.4938 based on 81 values.
Large sample test statistic Z = 1.21001
Two-tailed probability of equaling or exceeding Z = 0.226274

NOTE: 141 total observations.

$p > 0.05$NS

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Mann-Whitney)

Sample 1: Observed Ability; Males (17 - 20)

Sample 2: Observed Ability; Females (17 - 20)

Test based on: Pairs

Average rank of first group = 68.5882 based on 85 values.
Average rank of second group = 79.25 based on 60 values.
Large sample test statistic Z = 1.53209
Two-tailed probability of equaling or exceeding Z = 0.125499

NOTE: 145 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Observed Ability; Males (21 - 25)

Sample 2: Observed Ability; Females (21 - 25)

Test based on: Pairs

Average rank of first group = 66.8133 based on 75 values.
Average rank of second group = 54.4792 based on 48 values.
Large sample test statistic Z = -1.92255
Two-tailed probability of equaling or exceeding Z = 0.0545369

NOTE: 123 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Observed Ability; Males (31 - 40)

Sample 2: Observed Ability; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 87.8038 based on 79 values.
Average rank of second group = 73.3765 based on 81 values.
Large sample test statistic Z = -2.01246
Two-tailed probability of equaling or exceeding Z = 0.0441715

NOTE: 160 total observations.

$p < 0.05$

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Wilcoxen)

Sample 1: Observed Ability; Males (17 - 20)

Sample 2: Self-assessed Ability; Males (17 - 20)

Test based on: Signs

Number of positive differences = 10
Number of negative differences = 56
Expected number = 33
Large sample test statistic Z = 5.53912
Two-tailed probability of equaling or exceeding Z = 3.04774E-8

NOTE: 85 total pairs. 19 tied pairs ignored.

$p < 0.01$

Comparison of Two Samples (Wilcoxen)

Sample 1: Observed Ability; Males (21 - 25)

Sample 2: Self-assessed Ability; Males (21 - 25)

Test based on: Signs

Number of positive differences = 16
Number of negative differences = 38
Expected number = 27
Large sample test statistic Z = 2.85774
Two-tailed probability of equaling or exceeding Z = 4.26684E-3

NOTE: 75 total pairs. 21 tied pairs ignored.

$p < 0.01$

Comparison of Two Samples (Wilcoxen)

Sample 1: Observed Ability; Males (31 - 40)

Sample 2: Self -assessed Ability; Males (31 - 40)

Test based on: Signs

Number of positive differences = 21
Number of negative differences = 37
Expected number = 29
Large sample test statistic Z = 1.9696
Two-tailed probability of equaling or exceeding Z = 0.0488843

NOTE: 79 total pairs. 21 tied pairs ignored.

$p < 0.01$

Comparison of Two Samples (Wilcoxen)

Sample 1: Observed Ability; Females (17 -20)

Sample 2: Self-assessed Ability; Females (17 - 20)

Test based on: Signs

Number of positive differences = 9
Number of negative differences = 35
Expected number = 22
Large sample test statistic Z = 3.76889
Two-tailed probability of equaling or exceeding Z = 1.64026E-4

NOTE: 60 total pairs. 16 tied pairs ignored.

$p < 0.01$

Comparison of Two Samples (Wilcoxen)

Sample 1: Observed Ability; Females (21 - 25)

Sample 2: Self-assessed Ability; Females (21 - 25)

Test based on: Signs

Number of positive differences = 8
Number of negative differences = 27
Expected number = 17.5
Large sample test statistic Z = 3.04256
Two-tailed probability of equaling or exceeding Z = 2.34592E-3

NOTE: 48 total pairs. 13 tied pairs ignored.

$p < 0.01$

Comparison of Two Samples (Wilcoxen)

Sample 1: Observed Ability; Females (31 - 40)

Sample 2: Self-assessed Ability; Females (31 -40)

Test based on: Signs

Number of positive differences = 19
Number of negative differences = 44
Expected number = 31.5
Large sample test statistic Z = 3.02372
Two-tailed probability of equaling or exceeding Z = 2.49704E-3

NOTE: 81 total pairs. 18 tied pairs ignored.

$p < 0.01$

Comparison of Two Samples (Mann-Whitney)

Sample 1: Self-assessed Ability; Males (17 - 20)

Sample 2: Self-assessed Ability; Males (21 - 25)

Test based on: Pairs

Average rank of first group = 74.6294 based on 85 values.
Average rank of second group = 87.1533 based on 75 values.
Large sample test statistic Z = 1.82718
Two-tailed probability of equaling or exceeding Z = 0.0676717

NOTE: 160 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Self-assessed Ability; Males (21 - 25)

Sample 2: Self-assessed Ability; Males (31 - 40)

Test based on: Pairs

Average rank of first group = 77.7267 based on 75 values.
Average rank of second group = 77.2848 based on 79 values.
Large sample test statistic Z = -0.0637719
Two-tailed probability of equaling or exceeding Z = 0.949146

NOTE: 154 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Self-assessed Ability; (17 -20)

Sample 2: Self-assessed Ability; (31 - 40)

Test based on: Pairs

Average rank of first group = 76.6294 based on 85 values.
Average rank of second group = 88.8165 based on 79 values.
Large sample test statistic Z = 1.75528
Two-tailed probability of equaling or exceeding Z = 0.079211

NOTE: 164 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Self-assessed Ability; Females (17 - 20)

Sample 2: Self-assessed Ability; Females (21 - 25)

Test based on: Pairs

Average rank of first group = 54.2917 based on 60 values.
Average rank of second group = 54.7604 based on 48 values.
Large sample test statistic Z = 0.0783862
Two-tailed probability of equaling or exceeding Z = 0.937515

NOTE: 108 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Self-assessed Ability; Females (21 - 25)

Sample 2: Self-assessed Ability; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 58.5833 based on 48 values.
Average rank of second group = 68.8025 based on 81 values.
Large sample test statistic Z = 1.59734
Two-tailed probability of equaling or exceeding Z = 0.110191

NOTE: 129 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Self-assessed Ability; Females (17 - 20)

Sample 2: Self-assessed Ability; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 64.8333 based on 60 values.
Average rank of second group = 75.5679 based on 81 values.
Large sample test statistic Z = 1.62548
Two-tailed probability of equaling or exceeding Z = 0.104059

NOTE: 141 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Self-assessed Ability; Males (17 - 20)

Sample 2: Self-assessed Ability; Females (17 - 20)

Test based on: Pairs

Average rank of first group = 78.0588 based on 85 values.
Average rank of second group = 65.8333 based on 60 values.
Large sample test statistic Z = -1.8301
Two-tailed probability of equaling or exceeding Z = 0.0672352

NOTE: 145 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Self-assessed Ability; Males (21 - 25)

Sample 2: Self-assessed Ability; Females (21 - 25)

Test based on: Pairs

Average rank of first group = 69.72 based on 75 values.
Average rank of second group = 49.9375 based on 48 values.
Large sample test statistic Z = -3.18821
Two-tailed probability of equaling or exceeding Z = 1.4317E-3

NOTE: 123 total observations.

$p < 0.01$

Comparison of Two Samples (Mann-Whitney)

Sample 1: Self-assessed Ability; Males (31 - 40)

Sample 2: Self-assessed Ability; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 86.8544 based on 79 values.
Average rank of second group = 74.3025 based on 81 values.
Large sample test statistic Z = -1.81881
Two-tailed probability of equaling or exceeding Z = 0.0689396

NOTE: 160 total observations.

$p > 0.05$NS

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Mann-Whitney)

Sample 1: Observed Safety; Males (17 - 20)

Sample 2: Observed Safety; Males (21 - 25)

Test based on: Pairs

Average rank of first group = 67.6647 based on 85 values.
Average rank of second group = 95.0467 based on 75 values.
Large sample test statistic Z = 3.7919
Two-tailed probability of equaling or exceeding Z = 1.4955E-4

NOTE: 160 total observations.

$p < 0.01$

Comparison of Two Samples (Mann-Whitney)

Sample 1: Observed Safety; Males (21 - 25)

Sample 2: Observed Safety; Males (31 - 40)

Test based on: Pairs

Average rank of first group = 70.7933 based on 75 values.
Average rank of second group = 83.8671 based on 79 values.
Large sample test statistic Z = 1.85206
Two-tailed probability of equaling or exceeding Z = 0.0640171

NOTE: 154 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Observed Safety; Males (17 - 20)

Sample 2: Observed Safety; Males (31 - 40)

Test based on: Pairs

Average rank of first group = 64 based on 85 values.
Average rank of second group = 102.405 based on 79 values.
Large sample test statistic Z = 5.25547
Two-tailed probability of equaling or exceeding Z = 1.47941E-7

NOTE: 164 total observations.

$p < 0.01$

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Mann-Whitney)

Sample 1: Observed Safety; Females (17 - 20)

Sample 2: Observed Safety; Females (21 - 25)

Test based on: Pairs

Average rank of first group = 54.4344 based on 61 values.
Average rank of second group = 55.7188 based on 48 values.
Large sample test statistic Z = 0.212042
Two-tailed probability of equaling or exceeding Z = 0.83207

NOTE: 109 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Observed Safety; Females (21 - 25)

Sample 2: Observed Safety; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 62.0729 based on 48 values.
Average rank of second group = 67.5061 based on 82 values.
Large sample test statistic Z = 0.808742
Two-tailed probability of equaling or exceeding Z = 0.418661

NOTE: 130 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Observed Safety; Females (17 - 20)

Sample 2: Observed Safety; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 67.4098 based on 61 values.
Average rank of second group = 75.4146 based on 82 values.
Large sample test statistic Z = 1.16244
Two-tailed probability of equaling or exceeding Z = 0.245056

NOTE: 143 total observations.

$p > 0.05$NS

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Mann-Whitney)

Sample 1:Observed Safety; Males (17 - 20)

Sample 2:Observed Safety; Females (17 - 20)

Test based on: Pairs

Average rank of first group = 68.2882 based on 85 values.
Average rank of second group = 80.7623 based on 61 values.
Large sample test statistic Z = 1.78632
Two-tailed probability of equaling or exceeding Z = 0.0740464

NOTE: 146 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Observed Safety; Males (21 - 25)

Sample 2: Observed Safety; Females (21 - 25)

Test based on: Pairs

Average rank of first group = 65.9667 based on 75 values.
Average rank of second group = 55.8021 based on 48 values.
Large sample test statistic Z = -1.58191
Two-tailed probability of equaling or exceeding Z = 0.11367

NOTE: 123 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Observed Safety; Males (31 - 40)

Sample 2: Observed Safety; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 89.7278 based on 79 values.
Average rank of second group = 72.5915 based on 82 values.
Large sample test statistic Z = -2.37597
Two-tailed probability of equaling or exceeding Z = 0.0175027

NOTE: 161 total observations.

$p < 0.05$

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Wilcoxen)

Sample 1: Observed Safety; Males (17 - 20)

Sample 2: Self-assessed Safety; Males (17 - 20)

Test based on: Signs

Number of positive differences = 6
Number of negative differences = 68
Expected number = 37
Large sample test statistic Z = 7.09111
Two-tailed probability of equaling or exceeding Z = 1.33937E-12

NOTE: 85 total pairs. 11 tied pairs ignored.

$p < 0.01$

Comparison of Two Samples (Wilcoxen)

Sample 1: Observed Safety; Males (21 - 25)

Sample 2: Self-assessed Safety; Males (21 - 25)

Test based on: Signs

Number of positive differences = 11
Number of negative differences = 47
Expected number = 29
Large sample test statistic Z = 4.59573
Two-tailed probability of equaling or exceeding Z = 4.31691E-6

NOTE: 75 total pairs. 17 tied pairs ignored.

$p < 0.01$

Comparison of Two Samples (Wilcoxen)

Sample 1: Observed Safety; Males (31 - 40)

Sample 2: Self-assessed Safety; Males (31 - 40)

Test based on: Signs

Number of positive differences = 17
Number of negative differences = 45
Expected number = 31
Large sample test statistic Z = 3.429
Two-tailed probability of equaling or exceeding Z = 6.059E-4

NOTE: 79 total pairs. 17 tied pairs ignored.

$p < 0.01$

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Wilcoxen)

Sample 1: Observed Safety; Females (17 - 20)

Sample 2: Self-assessed Safety; Females (17 - 20)

Test based on: Signs

Number of positive differences = 13
Number of negative differences = 38
Expected number = 25.5
Large sample test statistic Z = 3.36067
Two-tailed probability of equaling or exceeding Z = 7.77637E-4

NOTE: 61 total pairs. 10 tied pairs ignored.

$p < 0.01$

Comparison of Two Samples (Wilcoxen)

Sample 1: Observed Safety; Females (21 - 25)

Sample 2: Self-assessed Safety; Females (21 - 25)

Test based on: Signs

Number of positive differences = 8
Number of negative differences = 31
Expected number = 19.5
Large sample test statistic Z = 3.52282
Two-tailed probability of equaling or exceeding Z = 4.27067E-4

NOTE: 48 total pairs. 9 tied pairs ignored.

$p < 0.01$

Comparison of Two Samples (Wilcoxen)

Sample 1: Observed Safety; Females (31 - 40)

Sample 2: Self-assessed Safety; Females (31 - 40)

Test based on: Signs

Number of positive differences = 14
Number of negative differences = 55
Expected number = 34.5
Large sample test statistic Z = 4.81543
Two-tailed probability of equaling or exceeding Z = 1.47073E-6

NOTE: 82 total pairs. 13 tied pairs ignored.

$p < 0.01$

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Mann-Whitney)

Sample 1: Self-assessed Safety; Males (17 - 20)

Sample 2: Self-assessed Safety; Males (21 - 25)

Test based on: Pairs

Average rank of first group = 73.4588 based on 85 values.
Average rank of second group = 88.48 based on 75 values.
Large sample test statistic Z = 2.1513
Two-tailed probability of equaling or exceeding Z = 0.0314525

NOTE: 160 total observations.

$p < 0.05$

Comparison of Two Samples (Mann-Whitney)

Sample 1: Self-assessed Safety; Males (21 - 25)

Sample 2: Self-assessed Safety; Males (31 - 40)

Test based on: Pairs

Average rank of first group = 76.6267 based on 75 values.
Average rank of second group = 78.3291 based on 79 values.
Large sample test statistic Z = 0.246462
Two-tailed probability of equaling or exceeding Z = 0.80532

NOTE: 154 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Self-assessed Safety; Males (17 - 20)

Sample 2: Self-assessed Safety; Males (31 - 40)

Test based on: Pairs

Average rank of first group = 74.1765 based on 85 values.
Average rank of second group = 91.4557 based on 79 values.
Large sample test statistic Z = 2.44913
Two-tailed probability of equaling or exceeding Z = 0.0143201

NOTE: 164 total observations.

$p < 0.05$

Comparison of Two Samples (Mann-Whitney)

Sample 1: Self-assessed Safety; Females (17 - 20)

Sample 2: Self-assessed Safety; Females (21 - 25)

Test based on: Pairs

Average rank of first group = 52.041 based on 61 values.
Average rank of second group = 58.7604 based on 48 values.
Large sample test statistic Z = 1.16982
Two-tailed probability of equaling or exceeding Z = 0.242074

NOTE: 109 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Self-assessed Safety; Females (21 - 25)

Sample 2: Self-assessed Safety; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 57.3854 based on 48 values.
Average rank of second group = 70.25 based on 82 values.
Large sample test statistic Z = 1.97577
Two-tailed probability of equaling or exceeding Z = 0.0481807

NOTE: 130 total observations.

$p < 0.05$

Comparison of Two Samples (Mann-Whitney)

Sample 1: Self-assessed Safety; Females (17 - 20)

Sample 2: Self-assessed Safety; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 58.8279 based on 61 values.
Average rank of second group = 81.7988 based on 82 values.
Large sample test statistic Z = 3.44424
Two-tailed probability of equaling or exceeding Z = 5.7276E-4

NOTE: 143 total observations.

$p < 0.01$

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Mann-Whitney)

Sample 1: Self-assessed Safety; Males (17 - 20)

Sample 2: Self-assessed Safety; Females (17 - 20)

Test based on: Pairs

Average rank of first group = 80.2647 based on 85 values.
Average rank of second group = 64.0738 based on 61 values.
Large sample test statistic Z = -2.41173
Two-tailed probability of equaling or exceeding Z = 0.0158771

NOTE: 146 total observations.

$p < 0.05$

Comparison of Two Samples (Mann-Whitney)

Sample 1: Self-assessed Safety; Males (21 - 25)

Sample 2: Self-assessed Safety; Females (21 - 25)

Test based on: Pairs

Average rank of first group = 68.3067 based on 75 values.
Average rank of second group = 52.1458 based on 48 values.
Large sample test statistic Z = -2.56362
Two-tailed probability of equaling or exceeding Z = 0.0103588

NOTE: 123 total observations.

$p < 0.05$

Comparison of Two Samples (Mann-Whitney)

Sample 1: Self-assessed Safety; Males (31 - 40)

Sample 2: Self-assessed Safety; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 85.2722 based on 79 values.
Average rank of second group = 76.8841 based on 82 values.
Large sample test statistic Z = -1.20372
Two-tailed probability of equaling or exceeding Z = 0.228695

NOTE: 161 total observations.

$p > 0.05$NS

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Mann-Whitney)

Sample 1: Adequacy of Test; Males (17 - 20)

Sample 2: Adequacy of Test; Males (21 - 25)

Test based on: Pairs

Average rank of first group = 68.0781 based on 64 values.
Average rank of second group = 66 based on 69 values.
Large sample test statistic Z = -0.315083
Two-tailed probability of equaling or exceeding Z = 0.752695

NOTE: 133 total observations.

p > 0.05NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Adequacy of Test; Males (21 - 25)

Sample 2: Adequacy of Test; Males (31 - 40)

Test based on: Pairs

Average rank of first group = 60.7971 based on 69 values.
Average rank of second group = 60.098 based on 51 values.
Large sample test statistic Z = -0.107879
Two-tailed probability of equaling or exceeding Z = 0.914087

NOTE: 120 total observations.

p > 0.05NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Adequacy of Test; Males (17 - 20)

Sample 2: Adequacy of Test; Males (31 - 40)

Test based on: Pairs

Average rank of first group = 59.3906 based on 64 values.
Average rank of second group = 56.2549 based on 51 values.
Large sample test statistic Z = -0.508573
Two-tailed probability of equaling or exceeding Z = 0.611048

NOTE: 115 total observations.

p > 0.05NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Adequacy of Test; Females (17 - 20)

Sample 2: Adequacy of Test; Females (21 - 25)

Test based on: Pairs

Average rank of first group = 47.74 based on 50 values.
Average rank of second group = 47.2273 based on 44 values.
Large sample test statistic Z = -0.0893348
Two-tailed probability of equaling or exceeding Z = 0.92881

NOTE: 94 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Adequacy of Test; Females (21 - 25)

Sample 2: Adequacy of Test; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 52.1136 based on 44 values.
Average rank of second group = 52.7833 based on 60 values.
Large sample test statistic Z = 0.111853
Two-tailed probability of equaling or exceeding Z = 0.910934

NOTE: 104 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Adequacy of Test; Females (17 - 20)

Sample 2: Adequacy of Test; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 55.38 based on 50 values.
Average rank of second group = 55.6 based on 60 values.
Large sample test statistic Z = 0.0338784
Two-tailed probability of equaling or exceeding Z = 0.972968

NOTE: 110 total observations.

$p > 0.05$NS

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Mann-Whitney)

Sample 1: Adequacy of Test; Males (17 - 20)

Sample 2: Adequacy of Test; Females (17 - 20)

Test based on: Pairs

Average rank of first group = 53.9688 based on 64 values.
Average rank of second group = 62.02 based on 50 values.
Large sample test statistic Z = 1.31638
Two-tailed probability of equaling or exceeding Z = 0.188046

NOTE: 114 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Adequacy of Test; Males (21 - 25)

Sample 2: Adequacy of Test; Females (21 - 25)

Test based on: Pairs

Average rank of first group = 53.471 based on 69 values.
Average rank of second group = 62.5341 based on 44 values.
Large sample test statistic Z = 1.46204
Two-tailed probability of equaling or exceeding Z = 0.14373

NOTE: 113 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Adequacy of Test; Males (31 - 40)

Sample 2: Adequacy of Test; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 50.3333 based on 51 values.
Average rank of second group = 60.8167 based on 60 values.
Large sample test statistic Z = 1.74262
Two-tailed probability of equaling or exceeding Z = 0.0813989

NOTE: 111 total observations.

$p > 0.05$NS

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Mann-Whitney)

Sample 1: .Importance of Car Type; Males (17 - 20)

Sample 2: Importance of Car Type; Males (21 - 25)

Test based on: Pairs

Average rank of first group = 66.7813 based on 64 values.
Average rank of second group = 68.1571 based on 70 values.
Large sample test statistic Z = 0.20668
Two-tailed probability of equaling or exceeding Z = 0.836255

NOTE: 134 total observations.

p > 0.05NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Importance of Car Type; Males (21 - 25)

Sample 2: Importance of Car Type; Males (31 - 40)

Test based on: Pairs

Average rank of first group = 57.9357 based on 70 values.
Average rank of second group = 66.2981 based on 52 values.
Large sample test statistic Z = 1.31726
Two-tailed probability of equaling or exceeding Z = 0.18775

NOTE: 122 total observations.

p > 0.05NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Importance of Car Type; Males (17 - 20)

Sample 2: Importance of Car Type; Males (31 - 40)

Test based on: Pairs

Average rank of first group = 54.2734 based on 64 values.
Average rank of second group = 63.7019 based on 52 values.
Large sample test statistic Z = 1.5238
Two-tailed probability of equaling or exceeding Z = 0.127558

NOTE: 116 total observations.

p > 0.05NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Importance of Car Type; Females (17 - 20)

Sample 2: Importance of Car Type; Females (21 - 25)

Test based on: Pairs

Average rank of first group = 44.1275 based on 51 values.
Average rank of second group = 53.4556 based on 45 values.
Large sample test statistic Z = 1.66629
Two-tailed probability of equaling or exceeding Z = 0.0956563

NOTE: 96 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Importance of Car Type; Females (21 - 25)

Sample 2: Importance of Car Type; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 58.1333 based on 45 values.
Average rank of second group = 49.15 based on 60 values.
Large sample test statistic Z = -1.52026
Two-tailed probability of equaling or exceeding Z = 0.128445

NOTE: 105 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Importance of Car Type; Females (17 - 20)

Sample 2: Importance of Car Type; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 56 based on 51 values.
Average rank of second group = 56 based on 60 values.
Large sample test statistic Z = 0
Two-tailed probability of equaling or exceeding Z = 1

NOTE: 111 total observations.

$p > 0.05$NS

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Mann-Whitney)

Sample 1: Importance of Car Type; Males (17 - 20)

Sample 2: Importance of Car Type; Females (17 - 20)

Test based on: Pairs

Average rank of first group = 64.0781 based on 64 values.
Average rank of second group = 50.3725 based on 51 values.
Large sample test statistic Z = -2.21625
Two-tailed probability of equaling or exceeding Z = 0.026674

NOTE: 115 total observations.

$p < 0.05$

Comparison of Two Samples (Mann-Whitney)

Sample 1: Importance of Car Type; Males (21 - 25)

Sample 2: Importance of Car Type; Females (21 - 25)

Test based on: Pairs

Average rank of first group = 61.3571 based on 70 values.
Average rank of second group = 52.7778 based on 45 values.
Large sample test statistic Z = -1.38042
Two-tailed probability of equaling or exceeding Z = 0.167457

NOTE: 115 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Importance of Car Type; Males (31 - 40)

Sample 2: Importance of Car Type; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 66.8462 based on 52 values.
Average rank of second group = 47.5333 based on 60 values.
Large sample test statistic Z = -3.17779
Two-tailed probability of equaling or exceeding Z = 1.48416E-3

NOTE: 112 total observations.

$p < 0.01$

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Mann-Whitney)

Sample 1: Passenger Effects; Males (17 - 20)

Sample 2: Passenger Effects; Males (21 - 25)

Test based on: Pairs

Average rank of first group = 78.4844 based on 64 values.
Average rank of second group = 57.4571 based on 70 values.
Large sample test statistic Z = -3.17515
Two-tailed probability of equaling or exceeding Z = 1.49772E-3

NOTE: 134 total observations.

$p < 0.01$

Comparison of Two Samples (Mann-Whitney)

Sample 1: Passenger Effects; Males (21 - 25)

Sample 2: Passenger Effects; Males (31 - 40)

Test based on: Pairs

Average rank of first group = 58.4929 based on 70 values.
Average rank of second group = 65.5481 based on 52 values.
Large sample test statistic Z = 1.10482
Two-tailed probability of equaling or exceeding Z = 0.269236

NOTE: 122 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Passenger Effects; Males (17 - 20)

Sample 2: Passenger Effects; Males (31 - 40)

Test based on: Pairs

Average rank of first group = 63.5078 based on 64 values.
Average rank of second group = 52.3365 based on 52 values.
Large sample test statistic Z = -1.80286
Two-tailed probability of equaling or exceeding Z = 0.0714093

NOTE: 116 total observations.

$p > 0.05$NS

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Mann-Whitney)

Sample 1: Passenger Effects; Females (17 - 20)

Sample 2: Passenger Effects; Females (21 - 25)

Test based on: Pairs

Average rank of first group = 46.7941 based on 51 values.
Average rank of second group = 49.3977 based on 44 values.
Large sample test statistic Z = 0.464476
Two-tailed probability of equaling or exceeding Z = 0.642303

NOTE: 95 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Passenger Effects; Females (21 - 25)

Sample 2: Passenger Effects; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 51.1591 based on 44 values.
Average rank of second group = 54.3279 based on 61 values.
Large sample test statistic Z = 0.529238
Two-tailed probability of equaling or exceeding Z = 0.596638

NOTE: 105 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Passenger Effects; Females (17 - 20)

Sample 2: Passenger Effects; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 53.2745 based on 51 values.
Average rank of second group = 59.1967 based on 61 values.
Large sample test statistic Z = 0.975966
Two-tailed probability of equaling or exceeding Z = 0.32908

NOTE: 112 total observations.

$p > 0.05$NS

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Mann-Whitney)

Sample 1: Passenger Effects; Males (17 - 20)

Sample 2: Passenger Effects; Females (17 - 20)

Test based on: Pairs

Average rank of first group = 65.0078 based on 64 values.
Average rank of second group = 49.2059 based on 51 values.
Large sample test statistic Z = -2.57367
Two-tailed probability of equaling or exceeding Z = 0.0100625

NOTE: 115 total observations.

$p < 0.05$

Comparison of Two Samples (Mann-Whitney)

Sample 1: Passenger Effects; Males (21 - 25)

Sample 2: Passenger Effects; Females (21 - 25)

Test based on: Pairs

Average rank of first group = 55.1786 based on 70 values.
Average rank of second group = 61.1932 based on 44 values.
Large sample test statistic Z = 0.957129
Two-tailed probability of equaling or exceeding Z = 0.338501

NOTE: 114 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Passenger Effects; Males (31 - 40)

Sample 2: Passenger Effects; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 55.8173 based on 52 values.
Average rank of second group = 58.0082 based on 61 values.
Large sample test statistic Z = 0.356198
Two-tailed probability of equaling or exceeding Z = 0.721689

NOTE: 113 total observations.

$p > 0.05$NS

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Mann-Whitney)

Sample 1: Radio Cassette Effect; Males (17 - 20)

Sample 2: Radio Cassette Effect; Males (21 - 25)

Test based on: Pairs

Average rank of first group = 69.5873 based on 63 values.
Average rank of second group = 62.6765 based on 68 values.
Large sample test statistic Z = -1.06749
Two-tailed probability of equaling or exceeding Z = 0.285749

NOTE: 131 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Radio Cassette Effect; Males (21 - 25)

Sample 2: Radio Cassette Effect; Males (31 - 40)

Test based on: Pairs

Average rank of first group = 58.8088 based on 68 values.
Average rank of second group = 58.0625 based on 48 values.
Large sample test statistic Z = -0.118527
Two-tailed probability of equaling or exceeding Z = 0.905645

NOTE: 116 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Radio Cassette Effect; Males (17 - 20)

Sample 2: Radio Cassette Effect; Males (31 - 40)

Test based on: Pairs

Average rank of first group = 58.7302 based on 63 values.
Average rank of second group = 52.4167 based on 48 values.
Large sample test statistic Z = -1.04783
Two-tailed probability of equaling or exceeding Z = 0.294717

NOTE: 111 total observations.

$p > 0.05$NS

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Mann-Whitney)

Sample 1:Radio Cassette Effect; Females (17 - 20)

Sample 2:Radio Cassette Effect; Females (21 - 25)

Test based on: Pairs

Average rank of first group = 42.0652 based on 46 values.
Average rank of second group = 49.0909 based on 44 values.
Large sample test statistic Z = 1.29304
Two-tailed probability of equaling or exceeding Z = 0.195995

NOTE: 90 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Radio Cassette Effect; Females (21 - 25)

Sample 2: Radio Cassette Effect; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 61.1705 based on 44 values.
Average rank of second group = 43.1491 based on 57 values.
Large sample test statistic Z = -3.16344
Two-tailed probability of equaling or exceeding Z = 1.55927E-3

NOTE: 101 total observations.

$p < 0.01$

Comparison of Two Samples (Mann-Whitney)

Sample 1: Radio Cassette Effect; Females (17 - 20)

Sample 2: Radio Cassette Effect; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 58.0761 based on 46 values.
Average rank of second group = 47.0965 based on 57 values.
Large sample test statistic Z = -1.9386
Two-tailed probability of equaling or exceeding Z = 0.0525496

NOTE: 103 total observations.

$p > 0.05$NS

Appendix A.6: Statistical tables (cont'd)

Comparison of Two Samples (Mann-Whitney)

Sample 1: Radio Cassette Effect; Males (17 - 20)

Sample 2: Radio Cassette Effect; Females (17 - 20)

Test based on: Pairs

Average rank of first group = 55.6984 based on 63 values.
Average rank of second group = 54.0435 based on 46 values.
Large sample test statistic Z = -0.2734
Two-tailed probability of equaling or exceeding Z = 0.784541

NOTE: 109 total observations.

$p > 0.05$NS

Comparison of Two Samples (Mann-Whitney)

Sample 1: Radio Cassette Effect; Males (21 - 25)

Sample 2: Radio Cassette Effect; Females (21 - 25)

Test based on: Pairs

Average rank of first group = 51.4559 based on 68 values.
Average rank of second group = 64.2955 based on 44 values.
Large sample test statistic Z = 2.08398
Two-tailed probability of equaling or exceeding Z = 0.0371616

NOTE: 112 total observations.

$p < 0.05$

Comparison of Two Samples (Mann-Whitney)

Sample 1: Radio Cassette Effect; Males (31 - 40)

Sample 2: Radio Cassette Effect; Females (31 - 40)

Test based on: Pairs

Average rank of first group = 57.4271 based on 48 values.
Average rank of second group = 49.2719 based on 57 values.
Large sample test statistic Z = -1.43424
Two-tailed probability of equaling or exceeding Z = 0.151503

NOTE: 105 total observations.

$p > 0.05$NS

Appendix A.6: Statistical Tables (cont'd)

Analysis of Variance for Incorrect Gear Error

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	2.1759979	3	.72533260	.7700	.5114
Sex	.26979450	1	.26979450	.2860	.5986
Age	2.0355670	2	1.0177838	1.081	.3405
2-FACTOR INTERACTION	1.4484913	2	.72424570	.7690	.4643
Sex Age	1.4484913	2	.72424570	.7690	.4643
RESIDUAL	317.37268	337	.91475840		
TOTAL (CORR.)	320.99708	342			

0 missing values have been excluded.
Effects: Sex $p>0.05$ NS
Age $p>0.05$ NS
Sex/Age $P>0.05$ NS

Analysis of Variance for leaving lights on full beam error

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	11.650166	3	3.8833887	3.345	.0194
Sex	.26707700	1	.26707750	.2300	.6369
Age	11.629769	2	5.8148844	5.008	.0072
2-FACTOR INTERACTION	4.6707791	2	2.3353896	2.011	.1354
Sex Age	4.6707791	2	2.3353896	2.011	.1354
RESIDUAL	391.28838	337	1.1610931		
TOTAL (CORR.)	407.60933	342			

0 missing values have been excluded.
Effects: Sex $p>0.05$ NS
Age $p<0.01$
Sex/Age $p>0.05$ NS

Analysis of Variance for misjudgement of gap in car park error

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	6.4483941	3	2.1494647	2.673	.0473
Sex	4.0407787	1	4.0407787	5.025	.0256
Age	3.1773030	2	1.5886519	1.976	.1403
2-FACTOR INTERACTION	4.2143208	2	2.1071604	2.628	.0743
Sex Age	4.2143208	2	2.1071604	2.628	.0743
RESIDUAL	271.00492	337	.80416890		
TOTAL (CORR.)	281.66764	342			

0 missing values have been excluded.
Effects: Sex $p<0.05$
Age $p>0.05$ NS
Sex/Age $p>0.05$ NS

Appendix A.6: Statistical Tables (cont'd)

Analysis of Variance for using wrong switches error

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	17.339533	3	5.7865110	4.747	.0029
Sex	16.062115	1	16.062115	13.17	.0003
Age	.53111110	2	.26555550	.2180	.8044
2-FACTOR INTERACTION	.39292880	2	.19646440	.1610	.8512
Sex Age	.39292880	2	.19646440	.1610	.8512
RESIDUAL	410.81314	337	1.2190301		
TOTAL (CORR.)	428.56568	342			

0 missing values have been excluded.
Effects: Sex p<0.01
Age p>0.05 NS
Sex/Age p>0.05 NS

Analysis of Variance for forgetting which gear in error

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	30.300914	3	10.100305	5.640	.0009
Sex	26.911829	1	26.911829	15.03	.0001
Age	6.0698520	2	3.0349260	1.695	.1852
2-FACTOR INTERACTION	1.3690802	2	.68454010	.3820	.6828
Sex Age	1.3690802	2	.68454010	.3820	.6828
RESIDUAL	603.53117	337	1.7908937		
TOTAL (CORR.)	635.20117	342			

0 missing values have been excluded.
Effects: Sex p<0.01
Age p>0.05 NS
Sex/Age P>0.05 NS

Analysis of Variance for misjudging speed of oncoming vehicle error

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	3.7514588	3	1.2504863	1.399	.2430
Sex	.11682650	1	.11682650	.1310	.7218
Age	3.4923487	2	1.7461744	1.953	.1434
2-FACTOR INTERACTION	.90179460	2	.45089730	.5040	.6044
Sex Age	.90179460	2	.45089730	.5040	.6044
RESIDUAL	301.29427	337	.89404830		
TOTAL (CORR.)	305.94752	342			

0 missing values have been excluded.
Effects: Sex p>0.05 NS
Age p>0.01 NS
Sex/Age p>0.05 NS

Appendix A.6: Statistical Tables (cont'd)

Analysis of Variance for missing exit on motorway error

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	3.1628313	3	1.0542771	.8630	.4604
Sex	1.7888734	1	1.7888734	1.465	.2270
Age	1.7067266	2	.85336330	.6990	.4979
2-FACTOR INTERACTION	1.5942700	2	.79713500	.6530	.5213
Sex Age	1.5942700	2	.79713500	.6530	.5213
RESIDUAL	411.58692	337	1.2213262		
TOTAL (CORR.)	416.34402	342			

0 missing values have been excluded.
Effects: Sex p>0.05 NS
Age p>0.05 NS
Sex/Age p>0.05 NS

Analysis of Variance for parking on double yellow lines violation

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	23.022916	3	7.6743050	4.975	.0022
Sex	.12118100	1	.12118100	.0790	.7824
Age	22.327089	2	11.163545	7.237	.0008
2-FACTOR INTERACTION	5.0520925	2	2.5260463	1.637	.1960
Sex Age	5.0520925	2	2.5260463	1.637	.1960
RESIDUAL	519.87251	337	1.5426484		
TOTAL (CORR.)	547.94752	342			

0 missing values have been excluded.
Effects: Sex p>0.05 NS
Age p<0.01
Sex/Age P>0.05 NS

Analysis of Variance for overtaking on inside violation

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	48.322740	3	16.107580	5.863	.0007
Sex	9.7655790	1	9.7655790	3.555	.0602
Age	33.652344	2	16.826172	6.125	.0024
2-FACTOR INTERACTION	2.2312819	2	1.1156410	.4860	.6660
Sex Age	2.2312819	2	1.1156410	.4860	.6660
RESIDUAL	925.84831	337	2.7473244		
TOTAL (CORR.)	976.40233	342			

0 missing values have been excluded.
Effects: Sex p>0.05 NS
Age p<0.01
Sex/Age p>0.05 NS

Appendix A.6: Statistical Tables (cont'd)

Analysis of Variance for speeding violation

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	69.131607	3	23.043869	7.016	.0001
Sex	2.3328520	1	2.3328520	.7100	.4089
Age	62.826394	2	31.413197	9.565	.0001
2-FACTOR INTERACTION	2.0024198	2	1.0012099	.3050	.7374
Sex Age	2.0024198	2	1.0012099	.3050	.7374
RESIDUAL	1106.8193	337	3.2843303		
TOTAL (CORR.)	1177.9534	342			

0 missing values have been excluded.
Effects: Sex p>0.05 NS
Age p<0.01
Sex/Age p>0.05 NS

Analysis of Variance for crossing red light violation

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	25.762079	3	8.5873600	4.501	.0041
Sex	.30990300	1	.30990300	.1620	.6915
Age	24.398996	2	12.199498	6.394	.0019
2-FACTOR INTERACTION	6.1101938	2	3.0550969	1.601	.2063
Sex Age	6.1101938	2	3.0550969	1.601	.2063
RESIDUAL	642.97321	337	1.9079324		
TOTAL (CORR.)	674.84548	432			

0 missing values have been excluded.
Effects: Sex p>0.05 NS
Age p<0.01
Sex/Age P>0.05 NS

Analysis of Variance for racing oncoming vehicle violation

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	3.7514588	3	1.2504863	1.399	.2430
Sex	.11682650	1	.11682650	.1310	.7218
Age	3.4923487	2	1.7461744	1.953	.1434
2-FACTOR INTERACTION	.90179460	2	.45089730	.5040	.6044
Sex Age	.90179460	2	.45089730	.5040	.6044
RESIDUAL	301.29427	337	.89404830		
TOTAL (CORR.)	305.94752	342			

0 missing values have been excluded.
Effects: Sex p>0.05 NS
Age p>0.05 NS
Sex/Age p>0.05 NS

Appendix A.6: Statistical Tables (cont'd)

Analysis of Variance for driving over BAC limit violation

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	5.0311813	3	1.6770684	2.164	.0928
Sex	.00004650	1	.00004650	.0000	.9939
Age	4.9999848	2	2.4999920	3.226	.0409
2-FACTOR INTERACTION	1.5486180	2	.77430900	.9990	.3692
Sex Age	1.5486180	2	.77430900	.9990	.3692
RESIDUAL	261.12282	337	.77484520		
TOTAL (CORR.)	267.70262	342			

0 missing values have been excluded.
Effects: Sex $p>0.05$ NS
Age $p<0.05$
Sex/Age $p>0.05$ NS

Analysis of Variance for racing other drivers violation

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	33.693869	3	11.231290	7.573	.0001
Sex	14.469983	1	14.469983	9.757	.0019
Age	15.143664	2	7.5718320	5.106	.0065
2-FACTOR INTERACTION	5.3533331	2	2.6766665	1.805	.1661
Sex Age	5.3533331	2	2.6766665	1.805	.1661
RESIDUAL	499.76329	337	1.4829771		
TOTAL (CORR.)	538.81050	342			

0 missing values have been excluded.
Effects: Sex $p<0.01$
Age $p<0.01$
Sex/Age $p>0.05$ NS

Appendix A.6: Statistical Tables (cont'd)

Analysis of Variance for Number of accidents per year (NACY)

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	8.1286353	3	2.7095451	9.821	.0000
Sex	.20187370	1	.20187370	.7320	.4021
Age	7.7086538	2	3.8543265	13.971	.0000
2-FACTOR INTERACTION	.07949060	2	.03974530	.1440	.0659
Sex Age	.07949060	2	.03974530	.1440	.0659
RESIDUAL	92.696553	336	.27582600		
TOTAL (CORR.)	100.90468	341			

0 missing values have been excluded.
Effects: Sex p>0.05 NS
Age p<0.01
Sex/Age P>0.05 NS

Analysis of Variance for number of 'at fault' accidents per year (NFAY)

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	4.8004298	3	1.6001433	8.231	.0000
Sex	.09536780	1	.09536780	.4910	.4916
Age	4.6064416	2	2.3032208	11.85	.0000
2-FACTOR INTERACTION	.03310800	2	.01655400	.0850	.9184
Sex Age	.03310800	2	.01655400	.0850	.9184
RESIDUAL	65.318074	336	.19439900		
TOTAL (CORR.)	70.151612	341			

0 missing values have been excluded.
Effects: Sex p>0.05 NS
Age p<0.01
Sex/Age p<0.05

Analysis of Variance for Number of convictions per year

Source of variation	Sum of squares	d.f.	Mean squares	F-ratio	Sig. level
MAIN EFFECTS	.20633620	3	.06877870	3.768	.0108
Sex	.07906070	1	.07906070	4.332	.0380
Age	.10652350	2	.05326180	2.918	.0551
2-FACTOR INTERACTION	.04210860	2	.02105430	1.154	.3165
Sex Age	.04210860	2	.02105430	1.154	.3165
RESIDUAL	7.7384687	336	.01825110		
TOTAL (CORR.)	7.9869134	341			

0 missing values have been excluded.
Effects: Sex p<0.05
Age p>0.05 NS
Sex/Age P>0.05 NS

Appendix A.7: Correlation Matrix

It should be noted that in the correlation matrices that follow, only the data points that were present with the NACY (number of accidents per year) and the NFAY (number of 'at fault' accidents per year) variables are included. Those 88 drivers (N=69; spread across all the groups) who were interviewed or who did not supply these data (n=19) are not included; thus for most of the matrices the degrees of freedom are 340df. There is no reason to suggest that these drivers were different from the 342 who did complete all parts of the questionnaire. In addition, the large sample numbers ensure that the significance level would only have been altered very slightly, if the limited data which these drivers did provide had been included in some of the correlations.

A.7 Correlation matrix

TABLE 1.1 : CORRELATION MATRIX

DF = 340

		1	2	3	4	5	6	7	8	9	10	11	12
NACY	1	1.0000											
NFAY	2	0.8311	1.0000										
NCOY	3	0.0949	0.0323	1.0000									
ERR(1)	4	0.0414	0.0478	-0.0348	1.0000								
ERR(2)	5	0.0679	0.0821	0.0286	0.1463	1.0000							
ERR(3)	6	-0.0524	0.0061	-0.0662	0.1300	0.1903	1.0000						
ERR(4)	7	0.0862	0.0773	0.0283	0.2094	0.2778	0.1742	1.0000					
ERR(5)	8	0.0002	0.0075	-0.0585	0.2255	0.2085	0.1947	0.1749	1.0000				
ERR(6)	9	0.0517	0.0039	-0.0516	0.3462	0.2681	0.2147	0.2896	0.5896	1.0000			
ERR(7)	10	0.0601	0.0620	-0.0310	0.3881	0.1581	0.0948	0.1245	0.2430	0.3327	1.0000		
ERR(8)	11	-0.0019	0.0192	-0.0443	0.1170	0.0618	0.1103	0.2292	0.0505	0.1147	0.0483	1.0000	
ERR(9)	12	-0.0491	-0.0516	-0.0388	0.1571	0.0004	0.0172	0.0963	0.1134	0.1499	0.0628	0.0203	1.0000
ERR(10)	13	0.0474	0.0585	-0.0756	0.3096	0.1330	0.2417	0.2531	0.2273	0.4415	0.1704	0.0870	0.1746
ERR(11)	14	0.1858	0.1672	0.0158	0.1760	0.0866	0.0948	0.2466	0.2142	0.3321	0.3013	0.0820	0.0211
ERR(12)	15	0.0191	0.0034	-0.0414	0.3312	0.1787	0.1391	0.0535	0.2543	0.3361	0.3764	0.1571	0.0362
ERR(13)	16	-0.0317	-0.0240	0.0188	-0.0103	0.0269	0.0933	0.0507	0.0746	0.0169	-0.0430	0.1772	0.0148
ERR(14)	17	-0.0290	-0.0292	-0.0686	0.3047	0.3313	0.1486	0.1723	0.0860	0.2533	0.3041	-0.0111	0.0798
ERR(15)	18	0.0634	0.0691	-0.0318	0.4529	0.7676	0.3945	0.5580	0.4212	0.6009	0.4586	0.1581	0.1120
DERR(1)	19	-0.0009	0.0227	0.0231	0.0014	0.0444	0.1218	0.0014	-0.0218	0.0133	0.0533	0.1176	-0.0367
DERR(2)	20	0.0514	0.0050	0.0454	-0.0538	0.2839	0.0745	0.0142	0.0077	0.0025	-0.0005	0.0421	-0.0118
DERR(3)	21	-0.0242	-0.0210	-0.0115	-0.0324	0.0565	0.0866	-0.0231	0.0576	0.0292	-0.0314	-0.0285	-0.0099
DERR(4)	22	-0.0303	-0.0217	-0.0220	-0.0281	0.0381	0.1115	-0.0181	-0.0319	-0.0080	0.0324	-0.0443	-0.0244
DERR(5)	23	-0.0210	-0.0170	-0.0218	-0.0465	0.0648	0.0416	0.0162	0.0569	0.0425	-0.0249	-0.0457	-0.0232
DERR(6)	24	0.0621	0.0239	0.1107	-0.0336	0.0862	0.0692	0.0677	-0.0125	0.1076	-0.0163	0.0435	-0.0426
DERR(7)	25	-0.0121	-0.0098	0.0027	0.1098	0.1973	0.0621	-0.0292	0.0008	-0.0366	0.2065	0.0202	-0.0234
DERR(8)	26	0.0420	0.0465	0.0388	-0.0657	0.0906	0.0691	0.1359	0.0136	0.0065	0.0194	0.4376	-0.0328
DERR(9)	27	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
DERR(10)	28	0.1183	0.1541	-0.0379	-0.0111	0.1825	0.0784	0.0073	-0.0118	0.0989	0.1110	0.0506	-0.0396
DERR(11)	29	0.0597	0.0710	-0.0335	0.0504	0.0450	-0.0009	0.0728	-0.0606	0.0264	0.0892	-0.0305	0.0805
DERR(12)	30	-0.0532	-0.0419	-0.0039	0.0084	0.1295	0.0687	-0.0665	-0.0391	-0.0580	0.1860	0.0101	-0.0318
DERR(13)	31	-0.0113	-0.0029	0.0471	-0.0388	0.0545	0.0951	0.0649	0.0130	-0.0131	-0.0424	0.2053	-0.0133
DERR(14)	32	-0.0478	-0.0317	-0.0435	0.2238	0.2366	0.1046	-0.1119	0.0726	0.1945	0.2418	-0.0988	0.1074
DERR(15)	33	-0.0410	-0.0265	-0.0353	0.2180	0.2645	0.1186	-0.1035	0.0681	0.1887	0.2536	-0.0786	0.0977

A.7 Correlation matrix (cont'd)

TABLE 1.1 (CONT)

ERR(10)	13	1.0000											
ERR(11)	14	0.2147	1.0000										
ERR(12)	15	0.2448	0.3418	1.0000									
ERR(13)	16	-0.0526	0.1268	0.0433	1.0000								
ERR(14)	17	0.1208	0.1348	0.1679	-0.0631	1.0000							
ERR(15)	18	0.3681	0.3242	0.3576	0.0348	0.6499	1.0000						
DERR(1)	19	0.0282	-0.0388	0.0637	-0.0197	0.0951	0.0771	1.0000					
DERR(2)	20	-0.0616	-0.0338	-0.0403	-0.0018	0.1574	0.1900	0.0764	1.0000				
DERR(3)	21	-0.0327	-0.0216	0.0417	-0.0053	-0.0168	0.0280	-0.0109	0.0809	1.0000			
DERR(4)	22	-0.0298	0.0155	0.0251	-0.0131	0.0579	0.0443	0.1265	0.0087	-0.0072	1.0000		
DERR(5)	23	0.0168	-0.0320	0.0218	-0.0125	-0.0016	0.0422	0.2247	0.0654	0.3296	0.3982	1.0000	
DERR(6)	24	-0.0368	-0.0052	-0.0032	0.0893	0.0672	0.0980	0.2473	0.1731	0.0929	0.2292	0.4659	1.0000
DERR(7)	25	-0.0277	-0.0225	0.0718	-0.0126	0.3260	0.2256	0.1159	0.1170	-0.0069	0.0013	0.0138	0.0974
DERR(8)	26	-0.0126	-0.0038	-0.0039	-0.0176	0.0707	0.1117	0.1290	0.2687	-0.0097	-0.0240	-0.0229	0.2150
DERR(9)	27	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
DERR(10)	28	0.0926	0.0642	0.0914	-0.0212	0.1258	0.1729	0.4048	0.1382	-0.0118	0.2190	0.2421	0.3510
DERR(11)	29	0.0290	0.1592	0.0997	0.0011	0.1259	0.1019	0.0313	-0.0078	-0.0105	0.2078	0.0388	0.0941
DERR(12)	30	-0.0056	-0.0397	0.2025	-0.0171	0.2400	0.1453	0.2322	0.1278	-0.0095	0.1245	0.0381	0.1294
DERR(13)	31	-0.0382	0.0245	-0.0021	0.7533	-0.0457	0.0398	-0.0147	0.0018	-0.0040	-0.0098	-0.0093	0.1456
DERR(14)	32	0.0792	0.0871	0.1597	-0.0472	0.7843	0.4352	0.0313	0.0216	-0.0257	0.0391	-0.0336	-0.0303
DERR(15)	33	0.0719	0.0829	0.1653	-0.0320	0.7943	0.4554	0.0832	0.0814	-0.0138	0.0683	0.0088	0.0424
		13	14	15	16	17	18	19	20	21	22	23	24

DERR(7)	25	1.0000								
DERR(8)	26	0.0861	1.0000							
DERR(9)	27	0.0000	0.0000	0.0000						
DERR(10)	28	0.1069	0.1389	0.0000	1.0000					
DERR(11)	29	0.0174	-0.0350	0.0000	0.4134	1.0000				
DERR(12)	30	0.5320	0.0482	0.0000	0.1782	0.1358	1.0000			
DERR(13)	31	-0.0094	-0.0131	0.0000	-0.0159	-0.0142	-0.0128	1.0000		
DERR(14)	32	0.3681	-0.0324	0.0000	0.0704	0.1138	0.2353	-0.0353	1.0000	
DERR(15)	33	0.4490	0.0108	0.0000	0.1315	0.1416	0.3031	-0.0141	0.9919	1.0000
		25	26	27	28	29	30	31	32	33

A.7 Correlation matrix (cont'd)

TABLE 1.2 : CORRELATION MATRIX

DF = 337

NACY	1	1.0000											
NFAY	2	0.8305	1.0000										
ERR(15)	3	0.0619	0.0659	1.0000									
DERR(15)	4	-0.0399	-0.0246	0.4600	1.0000								
DASS(1)	5	-0.2068	-0.1964	-0.3373	0.0205	1.0000							
DASS(2)	6	-0.2130	-0.1905	-0.4515	-0.0837	0.8715	1.0000						
DASS(3)	7	-0.1510	-0.1330	-0.3377	-0.1655	0.7809	0.7485	1.0000					
DASS(4)	8	-0.1772	-0.1576	-0.2997	-0.1520	0.7152	0.6957	0.7712	1.0000				
DASS(5)	9	-0.1738	-0.1780	-0.3257	-0.1835	0.7194	0.7011	0.7897	0.7022	1.0000			
DASS(6)	10	-0.1686	-0.1521	-0.3693	-0.0583	0.7942	0.7531	0.6652	0.6323	0.6350	1.0000		
DASS(1)	11	-0.0289	0.0532	0.0136	-0.0533	0.1141	0.1186	0.1372	0.1269	0.1688	0.1190	1.0000	
DASS(2)	12	-0.0574	-0.0183	-0.0417	0.0186	0.1964	0.2002	0.1690	0.1642	0.2249	0.1265	0.7027	1.0000
DASS(3)	13	-0.1263	-0.0936	-0.0098	-0.0244	0.1346	0.1417	0.1195	0.1057	0.1367	0.0901	0.5602	0.5927
DASS(4)	14	-0.0885	-0.0961	0.0344	0.0062	0.1025	0.0779	0.1177	0.1470	0.1341	0.0582	0.4390	0.4644
DASS(5)	15	-0.0845	-0.0987	-0.0154	-0.0254	0.1615	0.1801	0.1400	0.1664	0.2394	0.0817	0.4482	0.4999
DASS(6)	16	0.0218	-0.0089	0.0200	-0.1185	0.0118	0.0402	0.0548	0.0399	0.0825	0.0345	0.5962	0.5450
		1	2	3	4	5	6	7	8	9	10	11	12

DASS(3)	13	1.0000			
DASS(4)	14	0.4693	1.0000		
DASS(5)	15	0.5405	0.4289	1.0000	
DASS(6)	16	0.4810	0.3668	0.4634	1.0000
		13	14	15	16

A.7 Correlation matrix (cont'd)

TABLE 1.3 : CORRELATION MATRIX

DF = 333

NACY	1	1.0000											
NFAY	2	0.8269	1.0000										
ERR(15)	3	0.0588	0.0612	1.0000									
DERR(15)	4	-0.0399	-0.0251	0.4607	1.0000								
NJP(1)	5	0.0184	-0.0233	-0.0388	-0.0192	1.0000							
NJP(2)	6	-0.0574	-0.0038	0.1306	0.0457	-0.4190	1.0000						
NJP(3)	7	0.0532	0.0254	-0.0351	0.0274	-0.5642	-0.2435	1.0000					
NJP(4)	8	-0.0434	0.0077	-0.0277	-0.0505	-0.4941	-0.0364	-0.1034	1.0000				
MJP(1)	9	-0.0045	-0.0485	-0.0226	-0.0242	0.8284	-0.3362	-0.5022	-0.3738	1.0000			
MJP(2)	10	-0.0503	-0.0046	0.1064	0.0365	-0.3419	0.7774	-0.1857	-0.0074	-0.3268	1.0000		
MJP(3)	11	0.0895	0.0694	-0.0180	-0.0203	-0.4197	-0.1483	0.7496	-0.1198	-0.6083	-0.2472	1.0000	
MJP(4)	12	-0.0700	-0.0141	-0.0363	0.0353	-0.4181	0.0411	-0.0786	0.7573	-0.4395	-0.0335	-0.2045	1.0000
TJP(1)	13	0.0073	-0.0432	-0.0429	-0.0409	0.8922	-0.3562	-0.5274	-0.4272	0.9712	-0.3377	-0.5593	-0.4532
TJP(2)	14	-0.0718	-0.0109	0.1373	0.0552	-0.3687	0.8390	-0.1870	-0.0250	-0.3488	0.9361	-0.1934	-0.0173
TJP(3)	15	0.0900	0.0734	-0.0236	-0.0037	-0.4903	-0.1725	0.8347	-0.0870	-0.6115	-0.2308	0.9587	-0.1560
TJP(4)	16	-0.0677	-0.0185	-0.0268	0.0218	-0.4696	0.0384	-0.0675	0.8316	-0.4561	-0.0040	-0.1753	0.9595
		1	2	3	4	5	6	7	8	9	10	11	12

TJP(1)	13	1.0000			
TJP(2)	14	-0.3733	1.0000		
TJP(3)	15	-0.6027	-0.2182	1.0000	
TJP(4)	16	-0.4925	-0.0203	-0.1358	1.0000
		13	14	15	16

TABLE 1.4 : CORRELATION MATRIX

DF = 339

NACY	1	1.0000											
NFAY	2	0.8216	1.0000										
ERR(15)	3	0.0637	0.0696	1.0000									
DERR(15)	4	-0.0540	-0.0389	0.4557	1.0000								
CARU(1)	5	0.0427	0.0081	-0.1178	-0.0299	1.0000							
CARU(2)	6	0.0330	0.0237	-0.0036	-0.0021	-0.2810	1.0000						
CARU(3)	7	-0.1455	-0.0920	0.0950	-0.0521	-0.3617	-0.1475	1.0000					
CARU(4)	8	0.0194	0.0370	0.0994	0.0386	-0.6267	-0.3388	0.0712	1.0000				
CARU(5)	9	-0.0725	-0.0584	-0.0074	0.0356	-0.2663	-0.1082	0.0975	-0.1416	1.0000			
SHAR(1)	10	0.0112	-0.0271	0.0117	0.0457	0.2988	0.2053	-0.1793	-0.2939	-0.2518	1.0000		
SHAR(2)	11	0.0124	0.0226	-0.0668	-0.0335	-0.0196	-0.0252	0.0876	0.0284	-0.0498	-0.3173	1.0000	
SHAR(3)	12	-0.1005	-0.0918	0.0477	-0.0394	-0.1983	-0.0849	0.2041	-0.0411	0.5052	-0.4504	-0.1120	1.0000
SHAR(4)	13	-0.0959	-0.0742	-0.0268	-0.0588	-0.0138	-0.0058	0.1267	-0.0739	0.0793	-0.2764	-0.0913	0.1217
SHAR(5)	14	0.1418	0.1608	0.0692	0.0653	-0.1625	-0.1817	-0.1297	0.4104	-0.0742	-0.3562	-0.2437	-0.2235
SHAR(6)	15	-0.0508	-0.0482	-0.1057	-0.0611	-0.0833	0.0144	0.1013	0.0491	-0.0211	-0.3111	-0.0868	0.0447
		1	2	3	4	5	6	7	8	9	10	11	12

SHAR(4)	13	1.0000		
SHAR(5)	14	-0.1993	1.0000	
SHAR(6)	15	-0.0397	-0.0548	1.0000
		13	14	15

TABLE 1.5 : CORRELATION MATRIX

DF = 333

NACY	1	1.0000											
NFAY	2	0.8268	1.0000										
ERR(15)	3	0.0588	0.0612	1.0000									
DERR(15)	4	-0.0399	-0.0251	0.4607	1.0000								
NPT(1)	5	0.0899	0.0535	0.0178	0.0364	1.0000							
NPT(2)	6	-0.0070	-0.0196	-0.0938	-0.0171	-0.3140	1.0000						
NPT(3)	7	-0.1059	-0.1003	0.0239	-0.0592	-0.4090	-0.1503	1.0000					
NPT(4)	8	-0.0846	-0.0705	-0.0913	-0.0622	-0.2016	-0.0828	0.1921	1.0000				
NPT(5)	9	0.0644	0.0884	0.1163	0.0417	-0.2636	-0.2742	-0.2267	-0.1680	1.0000			
NPT(6)	10	-0.0600	-0.0299	-0.0350	0.0072	-0.3748	-0.1601	-0.0462	-0.0569	-0.1247	1.0000		
MPT(1)	11	0.0276	-0.0280	-0.0231	-0.0122	0.8222	-0.2586	-0.3106	-0.1286	-0.2599	-0.3013	1.0000	
MPT(2)	12	0.0746	0.0777	-0.0790	-0.0074	-0.2400	0.8761	-0.1393	-0.0872	-0.2516	-0.1670	-0.3353	1.0000
MPT(3)	13	-0.0994	-0.0939	0.0328	-0.0549	-0.3974	-0.1517	0.9720	0.1777	-0.2149	-0.0407	-0.3263	-0.1399
MPT(4)	14	-0.0886	-0.0746	-0.0936	-0.0491	-0.2037	-0.0814	0.2246	0.9400	-0.1668	-0.0623	-0.1617	-0.0857
MPT(5)	15	0.0595	0.0833	0.1241	0.0526	-0.2023	-0.2606	-0.2023	-0.1587	0.8552	-0.0971	-0.3408	-0.2687
MPT(6)	16	-0.0741	-0.0320	-0.0147	0.0353	-0.3135	-0.1410	-0.0636	-0.0639	-0.0606	0.8265	-0.3920	-0.1641
TPT(1)	17	0.0455	-0.0152	-0.0147	-0.0129	0.8751	-0.2646	-0.3415	-0.1446	-0.2661	-0.3306	0.9665	-0.3063
TPT(2)	18	0.0559	0.0573	-0.0830	0.0073	-0.2579	0.9155	-0.1485	-0.0887	-0.2589	-0.1661	-0.3179	0.9799
TPT(3)	19	-0.0993	-0.0934	0.0435	-0.0473	-0.3998	-0.1505	0.9827	0.1770	-0.2173	-0.0465	-0.3221	-0.1371
TPT(4)	20	-0.0872	-0.0742	-0.0885	-0.0571	-0.2085	-0.0745	0.2197	0.9569	-0.1680	-0.0650	-0.1572	-0.0800
TPT(5)	21	0.0676	0.0972	0.1163	0.0636	-0.2183	-0.2644	-0.2099	-0.1640	0.8966	-0.1055	-0.3234	-0.2633
TPT(6)	22	-0.0829	-0.0387	-0.0156	0.0054	-0.3475	-0.1468	-0.0476	-0.0582	-0.0714	0.8805	-0.3911	-0.1655
		1	2	3	4	5	6	7	8	9	10	11	12

MPT(3)	13	1.0000									
MPT(4)	14	0.2103	1.0000								
MPT(5)	15	-0.1935	-0.1587	1.0000							
MPT(6)	16	-0.0668	-0.0684	-0.1093	1.0000						
TPT(1)	17	-0.3496	-0.1729	-0.3118	-0.3837	1.0000					
TPT(2)	18	-0.1481	-0.0867	-0.2739	-0.1576	-0.3140	1.0000				
TPT(3)	19	0.9923	0.2117	-0.1941	-0.0699	-0.3498	-0.1483	1.0000			
TPT(4)	20	0.2034	0.9890	-0.1588	-0.0708	-0.1725	-0.0816	0.2046	1.0000		
TPT(5)	21	-0.2001	-0.1637	0.9722	-0.1017	-0.3275	-0.2672	-0.2016	-0.1643	1.0000	
TPT(6)	22	-0.0490	-0.0625	-0.0998	0.9712	-0.4099	-0.1609	-0.0539	-0.0662	-0.1029	1.0000
		13	14	15	16	17	18	19	20	21	22

A.7 Correlation matrix (cont'd)

TABLE 1.6 : CORRELATION MATRIX

DF = 337

		1	2	3	4	5	6	7	8	9	10	11	12
NACY	1	1.0000											
NFAY	2	0.8312	1.0000										
ERR(15)	3	0.0638	0.0686	1.0000									
DERR(15)	4	-0.0392	-0.0254	0.4559	1.0000								
MLS	5	-0.1181	-0.1045	-0.2103	-0.1352	1.0000							
YRS	6	-0.2295	-0.1979	-0.2035	-0.1825	0.6436	1.0000						
NLES	7	0.0762	0.0189	0.0398	-0.0076	-0.1204	-0.0809	1.0000					
NTFS	8	0.0773	0.0108	-0.0494	-0.0540	0.0569	0.0837	0.4491	1.0000				
SEX 2	9	-0.0608	-0.0586	0.0567	-0.0587	-0.1377	0.0319	0.2323	0.0285	1.0000			
AGE 2	10	-0.0288	-0.0400	-0.0435	0.0617	-0.1523	-0.2325	0.0797	0.0729	-0.1089	1.0000		
AGE 3	11	-0.2274	-0.1999	-0.1174	-0.1730	0.5143	0.8155	-0.0407	0.0756	0.1293	-0.4934	1.0000	
STAT 2	12	-0.1821	-0.1558	-0.1358	-0.1265	0.3672	0.5973	-0.0233	0.0761	0.1095	-0.1209	0.5887	1.0000
STAT 3	13	-0.0285	-0.0421	0.1226	0.0367	-0.0137	0.0378	-0.0260	-0.0252	0.1661	-0.0589	0.1915	-0.1252
DRBF 2	14	0.0965	0.1172	0.0367	0.0137	0.0957	-0.0376	-0.1012	0.0047	-0.1584	0.0119	-0.0365	-0.0290

		13	14
STAT 3	13	1.0000	
DRBF 2	14	-0.0753	1.0000

A.7 Correlation matrix (cont'd)

TABLE 1.7 : CORRELATION MATRIX

DF = 339

		1	2	3	4	5	6	7	8	9	10	11	12
NACY	1	1.0000											
NFAY	2	0.8310	1.0000										
ERR(15)	3	0.0639	0.0695	1.0000									
DERR(15)	4	-0.0400	-0.0258	0.4551	1.0000								
IMP(1)	5	-0.0614	-0.0840	0.0195	-0.0088	1.0000							
IMP(2)	6	0.1331	0.1088	0.0896	0.1040	0.4112	1.0000						
IMP(3)	7	0.1014	0.0544	0.0234	0.0099	0.3987	0.7613	1.0000					
IMP(4)	8	0.0020	-0.0475	0.0728	0.0742	0.3457	0.4561	0.4191	1.0000				
IMP(5)	9	-0.0697	-0.0061	-0.0644	0.0357	0.2274	0.2626	0.2834	0.2795	1.0000			
IMP(6)	10	-0.0352	-0.0547	0.0134	0.0598	-0.0708	0.0490	0.0292	0.0794	0.0097	1.0000		
IMP(7)	11	-0.1231	-0.1234	-0.0297	-0.0377	0.0754	0.0106	0.0408	0.0895	0.3316	0.1813	1.0000	
IMP(8)	12	-0.1295	-0.1727	-0.1264	-0.1486	-0.0294	-0.0788	-0.0656	0.1045	0.3421	0.0959	0.5026	1.0000
IMP(9)	13	-0.0505	-0.0334	-0.0515	-0.0656	0.0045	0.0390	0.0500	0.1066	0.2722	0.2188	0.3436	0.3204
IMP(10)	14	0.0261	-0.0001	0.1005	0.1398	0.4129	0.3766	0.2680	0.3618	0.3049	0.0738	0.0888	0.0262

		13	14
IMP(9)	13	1.0000	
IMP(10)	14	0.0839	1.0000

A.7 Correlation matrix (cont'd)

TABLE 1.8 : CORRELATION MATRIX

DF = 340

NACY	1	1.0000											
NFAY	2	0.8311	1.0000										
ERR(15)	3	0.0634	0.0691	1.0000									
DERR(15)	4	-0.0410	-0.0265	0.4554	1.0000								
DANR(1)	5	-0.0314	-0.1010	-0.0442	-0.0892	1.0000							
DANR(2)	6	-0.0357	-0.1020	-0.0770	-0.0860	0.6063	1.0000						
DANR(3)	7	0.0301	-0.0122	-0.0160	-0.0217	0.2337	0.3145	1.0000					
DANR(4)	8	0.0081	-0.0308	-0.1412	-0.1016	0.0040	0.1303	0.1353	1.0000				
DANR(5)	9	-0.0668	-0.0292	-0.0673	-0.0347	0.3241	0.3214	0.2791	0.3346	1.0000			
DANR(6)	10	-0.0075	-0.0182	-0.0301	-0.1219	0.4944	0.3619	0.2202	0.0642	0.3373	1.0000		
DANR(7)	11	-0.0726	-0.0200	-0.1112	-0.1115	0.2061	0.3343	0.2658	0.3440	0.4500	0.3140	1.0000	
DANR(8)	12	-0.0869	-0.0515	-0.0716	-0.0746	0.3033	0.3350	0.2681	0.2602	0.3670	0.2213	0.4960	1.0000
DANR(9)	13	-0.0442	-0.0638	-0.1287	-0.0675	0.1764	0.3048	0.1712	0.3661	0.3281	0.1990	0.4824	0.5458
		1	2	3	4	5	6	7	8	9	10	11	12

DANR(9)	13	1.0000
		13

TABLE 1.9 : CORRELATION MATRIX

DF = 340

		1	2	3	4	5	6	7	8	9	10	11	12
NACY	1	1.0000											
NFAY	2	0.8311	1.0000										
ERR(15)	3	0.0634	0.0691	1.0000									
DERR(15)	4	-0.0410	-0.0265	0.4554	1.0000								
ACT(1)	5	0.0071	0.0074	0.0835	0.0187	1.0000							
ACT(2)	6	0.0950	0.0800	0.1117	0.0774	0.1098	1.0000						
ACT(3)	7	0.1413	0.1565	0.1219	0.0812	0.2496	0.2576	1.0000					
ACT(4)	8	0.1053	0.1110	0.1962	0.1045	0.0099	0.2852	0.1628	1.0000				
ACT(5)	9	0.0943	0.1078	0.0799	-0.0234	0.1524	0.1423	0.2379	0.0699	1.0000			
ACT(6)	10	0.1397	0.1748	0.1293	0.0974	0.0504	0.3700	0.1771	0.4716	0.2034	1.0000		
ACT(7)	11	-0.0596	-0.0723	0.0454	0.0193	0.1158	0.0191	0.1731	-0.0630	0.2080	-0.0486	1.0000	
ACT(8)	12	0.1493	0.1271	0.1761	0.1669	0.1389	0.3797	0.3025	0.3147	0.2226	0.3024	0.0493	1.0000
ACT(9)	13	0.1285	0.1049	0.0650	0.0003	0.2450	0.1141	0.1316	-0.0405	0.2432	0.0873	0.2509	0.1477
ACT(10)	14	0.0518	0.0723	0.2012	0.1649	0.1255	0.2183	0.1430	0.3416	0.2867	0.2888	0.1197	0.2626
ACT(11)	15	0.1387	0.0982	0.0932	0.0881	0.1158	0.1574	0.2734	0.2645	0.2686	0.1763	0.2031	0.3634
ACT(12)	16	-0.0085	0.0021	0.0083	-0.0378	0.1111	0.2310	0.0993	0.1990	0.0700	0.1139	0.0556	0.3457
ACT(13)	17	0.1536	0.1271	0.1291	0.0843	0.0357	0.1453	0.0488	0.4038	0.0773	0.2867	-0.0046	0.2168
ACT(14)	18	0.1354	0.0641	0.0487	0.1378	-0.0166	0.1652	0.2369	0.1374	0.1472	0.1312	0.2593	0.2357

		13	14	15	16	17	18
ACT(9)	13	1.0000					
ACT(10)	14	0.2015	1.0000				
ACT(11)	15	0.2866	0.2728	1.0000			
ACT(12)	16	-0.0030	0.0670	0.1656	1.0000		
ACT(13)	17	0.0097	0.3984	0.2445	0.1486	1.0000	
ACT(14)	18	0.1511	0.0339	0.2743	0.1577	0.0639	1.0000

A.7 Correlation matrix (cont'd)

TABLE 1.10 : CORRELATION MATRIX

DF = 340

		1	2	3	4	5	6	7	8	9	10	11	12
NACY	1	1.0000											
NFAY	2	0.8311	1.0000										
ERR(15)	3	0.0634	0.0691	1.0000									
DERR(15)	4	-0.0410	-0.0265	0.4554	1.0000								
CONF(1) 2	5	0.0737	0.0631	0.1395	0.1430	1.0000							
CONF(2) 2	6	0.0416	0.0049	0.3670	0.1256	0.0415	1.0000						
CONF(2) 3	7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000					
CONF(3) 2	8	0.0016	0.0150	0.1831	0.0693	0.1314	0.0673	0.0000	1.0000				
CONF(4) 2	9	0.0877	0.0961	0.2602	-0.0788	-0.0332	0.0784	0.0000	-0.0143	1.0000			
CONF(5) 2	10	0.0353	0.0727	0.1152	0.0234	0.0196	-0.0206	0.0000	0.0799	0.0961	1.0000		
CONF(6) 2	11	0.0250	-0.0310	0.0800	0.0310	-0.0703	0.0261	0.0000	-0.1176	-0.0461	-0.0821	1.0000	
CONF(7) 2	12	0.0955	0.1252	0.0662	0.0920	0.0807	-0.0749	0.0000	-0.0857	-0.1518	-0.0102	0.0095	1.0000
CONF(8) 2	13	-0.0287	-0.0210	-0.0510	-0.0171	-0.0224	-0.0709	0.0000	-0.0280	-0.0299	-0.0124	-0.0194	-0.0149
CONF(9) 2	14	-0.0287	-0.0210	0.0458	0.0028	-0.0224	0.0414	0.0000	-0.0280	0.0980	-0.0124	-0.0194	-0.0149
CONF(11) 2	15	0.0534	0.0653	0.0590	0.0585	-0.0504	-0.0585	0.0000	-0.0031	-0.0673	-0.0279	-0.0437	0.0619
CONF(12) 2	16	-0.0487	-0.0332	0.0957	0.2674	0.0708	-0.0365	0.0000	-0.0690	-0.0212	-0.0306	-0.0479	0.1377
CONF(13) 2	17	0.0492	0.0555	0.2219	0.2400	0.0048	-0.0186	0.0000	-0.0287	0.0775	-0.0805	-0.0560	0.1129

		13	14	15	16	17
CONF(8) 2	13	1.0000				
CONF(9) 2	14	-0.0029	1.0000			
CONF(11) 2	15	-0.0066	-0.0066	1.0000		
CONF(12) 2	16	-0.0072	-0.0072	-0.0163	1.0000	
CONF(13) 2	17	-0.0333	-0.0333	0.0887	0.0674	1.0000

A.7 Correlation matrix (cont'd)

TABLE 1.11 : CORRELATION MATRIX

DF = 333

NACY	1	1.0000									
NFAY	2	0.8268	1.0000								
ERR(15)	3	0.0588	0.0612	1.0000							
DERR(15)	4	-0.0399	-0.0251	0.4607	1.0000						
NJW	5	-0.0112	-0.0374	0.0095	-0.0539	1.0000					
MPW	6	-0.0030	-0.0084	-0.0379	0.0792	0.2571	1.0000				
TPW	7	0.0182	-0.0202	-0.0486	0.0319	0.4456	0.8519	1.0000			
NRAD	8	0.0007	-0.0507	0.1490	0.1817	-0.0731	0.0554	-0.0320	1.0000		
MRAD	9	0.0134	-0.0422	0.1242	0.1543	-0.0561	0.1069	0.0017	0.9362	1.0000	
TRAD	10	0.0190	-0.0347	0.1285	0.1668	-0.0587	0.0941	-0.0078	0.9595	0.9900	1.0000
		1	2	3	4	5	6	7	8	9	10

A.7 Correlation matrix (cont'd)

TABLE 1.12 : CORRELATION MATRIX

DF = 333

		1	2	3	4	5	6	7	8	9	10	11	12
NACY	1	1.0030											
NFAY	2	0.8268	1.0000										
ERR(15)	3	0.0588	0.0612	1.0000									
DERR(15)	4	-0.0399	-0.0251	0.4607	1.0000								
NJPS(1)	5	0.0899	0.0535	0.0178	0.0364	1.0000							
NJPS(2)	6	-0.0047	0.0066	-0.0314	0.0247	-0.6873	1.0000						
NJPS(3)	7	-0.1171	-0.0799	0.0109	-0.0750	-0.6035	-0.1641	1.0000					
MJPS(1)	8	0.0276	-0.0280	-0.0231	-0.0122	0.8222	-0.5752	-0.4863	1.0000				
MJPS(2)	9	0.0686	0.0903	-0.0080	0.0419	-0.4876	0.7994	-0.2159	-0.6497	1.0000			
MJPS(3)	10	-0.1068	-0.0597	0.0350	-0.0273	-0.5282	-0.1204	0.8514	-0.5822	-0.2397	1.0000		
TJPS(1)	11	0.0455	-0.0152	-0.0147	-0.0129	0.8751	-0.6104	-0.5193	0.9665	-0.6141	-0.5774	1.0000	
TJPS(2)	12	0.0426	0.0606	-0.0172	0.0506	-0.5402	0.8511	-0.2014	-0.6291	0.9549	-0.2177	-0.6545	1.0000
TJPS(3)	13	-0.1034	-0.0454	0.0374	-0.0368	-0.5543	-0.1187	0.8850	-0.5769	-0.2248	0.9767	-0.5930	-0.2205

		13
TJPS(3)	13	1.0000

A.8 List of variables

This appendix lists those dependent and explanatory variables used in the course of the correlation matrix and the multi-variate analysis. For each continuous variable, the minimum, mean and maximum values are given and for all variables the number of non-missing values is shown.

Label	Description	Minimum	Mean	Maximum
	Accidents			
NACC	Number of accidents (343)	0	1.14	15
NACY	Number of accidents per year (342)	0	0.29	5
NFAC	Number of "at fault" accidents (342)	0	0.62	10
NFAY	Number of "at fault" accidents per year (342)	0	0.18	5
	Observed number of UDAs of the following type: (439)			
ERR1	Braking	0	3.6	24
ERR2	Steering	0	26.1	160
ERR3	Gears	0	4.0	74
ERR4	Mirrors	0	10.5	74
ERR5	Indicating	0	2.6	20
ERR6	Position on road	0	9.1	49
ERR7	Following too closely	0	3.4	58
ERR8	Joining traffic	0	0.5	6
ERR9	Leaving traffic	0	0.1	2
ERR10	Overtaking	0	1.0	9
ERR11	Erratic manoeuvres	0	1.0	14
ERR12	Consideration to other road users	0	1.0	13
ERR13	Slow speed or progress	0	0.0	7
ERR14	Speed too fast	0	16.9	111
ERR15	Total of all UDAs 1 to 14	2	79.8	266

A.8 List of variables (cont'd)

Label	Description	Minimum	Mean	Maximum
	Observed number of dangerous UDAs of the following type: (439)			
DERR1	Braking	0	0.07	7
DERR2	Steering	0	0.11	7
DERR3	Gears	0	0.01	1
DERR4	Mirrors	0	0.03	3
DERR5	Indicating	0	0.02	2
DERR6	Position on road	0	0.10	6
DERR7	Following too closely	0	0.15	20
DERR8	Joining traffic	0	0.04	2
DERR9	Leaving traffic	0	0.00	0
DERR10	Overtaking	0	0.05	2
DERR11	Erratic manoeuvres	0	0.06	3
DERR12	Consideration to other road users	0	0.04	3
DERR13	Slow speed or progress	0	0.02	5
DERR14	Speed too fast	0	7.71	110
DERR15	Total of all UDAs 1 to 14	2	8.39	118
M	Average mileage per year (thousands) (421)	0.3	9.4	50.0
MLS	Total mileage per driver (thousands) (422)	0.2	79.0	600.0
YRS	Years of driving (428)	0.1	7.2	23.6
NCH	Number of children (430)	0	0.42	4.0
	Proportion of time spent on journeys for the following purposes: (429)			
CARU1	To and from work	0	0.40	0.95
CARU2	As part of job	0	0.09	0.95
CARU3	Shopping	0	0.10	0.60
CARU4	Leisure	0	0.38	1.00
CARU5	Other	0	0.05	0.80
	Proportion of driving time with following passengers: (430)			
SHAR1	Alone	0.0	0.62	1.00
SHAR2	Partner/spouse only	0.0	0.10	0.85
SHAR3	Children only	0.0	0.05	0.90
SHAR4	Partner/spouse and children	0.0	0.03	0.90
SHAR5	Friends	0.0	0.16	0.90
SHAR6	Others	0.0	0.04	0.80
NLES	Number of driving lessons (343)	0	19.0	100
NTES	Number of driving tests (343)	1	1.7	5
NCON	Number of driving convictions (344)	0	0.2	4

Label	Description	Minimum	Mean	Maximum
	Importance of following qualities when buying a car (scale 1 to 7) (342)			
IMP1	Speed	1	4.5	7
IMP2	Acceleration	1	4.0	7
IMP3	Engine size	1	4.5	7
IMP4	Comfort	1	4.1	7
IMP5	Price	1	5.4	7
IMP6	Reliability	1	5.8	7
IMP7	Safety	2	6.4	7
IMP8	Utility	2	6.0	7
IMP9	Appearance	1	5.0	7
IMP10	Other	1	4.8	7
	Perceived level of danger (scale 1 to 7) for the following: (343)			
DANR1	Motorway	1	4.0	7
DANR2	Dual carriageway	1	3.8	7
DANR3	Rural roads	1	4.2	7
DANR4	Urban roads	1	3.9	7
DANR5	Roundabouts	1	3.6	7
DANR6	Joining a motorway	1	4.4	7
DANR7	Right turns	1	3.6	7
DANR8	Left turns	1	2.2	7
DANR9	Traffic lights	1	2.5	7
	Frequency of the following actions: (scale 1 to 7) (343)			
ACT1 a	Wrong gear used	1	2.0	6
ACT2 b	Park on double yellow lines	1	2.1	7
ACT3 c	Lights on full beam	1	2.1	6
ACT4 d	Overtake on inside	1	2.6	7
ACT5 e	Misjudge gap in a car park	1	1.7	6
ACT6 f	Speed late at night	1	4.0	7
ACT7 g	Use wrong switches	1	1.9	7
ACT8 h	Cross red traffic lights	1	2.3	7
ACT9 i	Need to check gear	1	2.6	7
ACT10 j	Race "oncoming" vehicles for gap	1	2.1	7
ACT11 k	Misjudge speed when overtaking	1	2.1	6
ACT12 l	Drive when over blood alcohol limit	1	1.4	7
ACT13 m	Race with other drivers	1	1.8	7
ACT14 n	Miss motorway exit	1	2.0	6
ACTE	Average of errors a,c,e,g,i,k,n	1	2.1	4.6
ACTV	Average of violations b,d,f,h,j,l,m	1	2.3	5.3
	Observers' assessment ratings of: (scale 1 to 7) (439)			
OASS1	General performance	1	3.9	7
OASS2	Safety	1	3.8	7
OASS3	Anticipation	1	3.7	7
OASS4	Concentration	1	4.2	7
OASS5	Observation	1	3.5	7
OASS6	Car control	1	3.5	7

A.8 List of variables (cont'd)

Label	Description	Minimum	Mean	Maximum
	Drivers' assessment ratings of: (scale 1 to 7) (439)			
DASS1	General performance	2	4.7	7
DASS2	Safety	2	5.0	7
DASS3	Anticipation	1	5.1	7
DASS4	Concentration	2	5.3	7
DASS5	Observation	2	5.0	7
DASS6	Car control	2	5.0	7
NJW	Number of journeys per week (439)	2	24.8	191
MPW	Mileage per week (439)	3	193	1439
TPW	Time per week spent driving (mins) (439)	20	412	1923
	Proportion of diary journeys for following purposes: (411)			
NJP1	Work/school	0.0	0.31	1.0
NJP2	Shopping	0.0	0.17	1.0
NJP3	Leisure	0.0	0.32	1.0
NJP4	Other	0.0	0.19	0.88
	Proportion of diary mileage for following purposes: (411)			
MJP1	Work/school	0.0	0.31	1.0
MJP2	Shopping	0.0	0.13	1.0
MJP3	Leisure	0.0	0.36	1.0
MJP4	Other	0.0	0.19	0.88
	Proportion of diary driving time for following purposes: (411)			
TJP1	Work/school	0.0	0.33	1.0
TJP2	Shopping	0.0	0.14	1.0
TJP3	Leisure	0.0	0.34	1.0
TJP4	Other	0.0	0.19	0.78
NRAD	**Proportion of journeys with radio/cassette on (411)**	0.0	0.64	1.0
MRAD	**Proportion of mileage with radio/cassette on (411)**	0.0	0.68	1.0
TRAD	**Proportion of driving time with radio/cassette on (411)**	0.0	0.67	1.0
	Proportion of journeys with the following number of passengers			
NJPS1	None	0.0	0.61	1.0
NJPS2	One	0.0	0.26	1.0
NJPS3	Two or more	0.0	0.13	1.0

A.8 List of variables (cont'd)

Label	Description	Minimum	Mean	Maximum
	Proportion of mileage with following numbers of passengers (411)			
MJPS1	None	0.0	0.57	1.0
MJPS2	One	0.0	0.28	1.0
MJPS3	Two or more	0.0	0.16	1.0
	Proportion of driving time with following numbers of passengers (411)			
TJPS1	None	0.0	0.58	1.0
TJPS2	One	0.0	0.27	1.0
TJPS3	Two or more	0.0	0.15	1.0
	Proportion of journeys with the following types of passengers (411)			
NPT1	Alone	0.0	0.61	1.0
NPT2	Partner only	0.0	0.10	1.0
NPT3	Children only	0.0	0.05	1.0
NPT4	Partner and children	0.0	0.02	0.68
NPT5	Friends only	0.0	0.12	0.81
NPT6	Other	0.0	0.10	0.78
	Proportion of mileage with the following types of passengers (411)			
MPT1	Alone	0.0	0.57	1.0
MPT2	Partner only	0.0	0.11	1.0
MPT3	Children only	0.0	0.05	1.0
MPT4	Partner and children	0.0	0.03	0.95
MPT5	Friends only	0.0	0.13	0.93
MPT6	Other	0.0	0.11	0.93
	Proportion of driving time with the following types of passengers (411)			
TPT1	Alone	0.0	0.58	1.0
TPT2	Partner only	0.0	0.10	1.0
TPT3	Children only	0.0	0.05	1.0
TPT4	Partner and children	0.0	0.03	1.0
TPT5	Friends only	0.0	0.13	0.89
TPT6	Other	0.0	0.11	0.90

A.8 List of variables (cont'd)

Label	Description
AGE	Age group (439) 1 = 17-20 years 2 = 21-25 years 3 = 31-40 years
SEX	Sex (439) 1 = male 2 = female
STA	Marital status (430) 1 = single 2 = married/co-habiting 3 = widowed/divorced/separated
SEGG	Socio-economic group (427) 1 = Non-manual (SEG 1-3) 2 = Manual (SEG 4-6) 3 = Students (SEG 7) 4 = Housekeeper (SEG 8) 5 = Unemployed (SEG 10)
STU	Student or not (427) 1 = Not student 2 = Student
DRBE	Drove before obtaining provisional licence (343) 1 = No 2 = Yes
"Continual" faults of the following types (439) where:	
	1 = no such continual fault 2 = continual fault
CONF1	Braking
CONF2	Steering
CONF3	Gears
CONF4	Mirrors
CONF5	Indicating
CONF6	Position on road
CONF7	Following too closely
CONF8	Joining traffic
CONF9	Leaving traffic
CONF10	Overtaking
CONF11	Erratic manoeuvres
CONF12	Consideration to other road users
CONF13	Speed too fast

A.8 List of variables (cont'd)

Label	Description
	Passengers of the following types which have "good" effects (ie better, slower, safer, concentrate more) (430) where:
	1 = no such effect
	2 = "good" effect
PASG1	partner
PASG2	parent
PASG3	brother
PASG4	sister
PASG5	boyfriend
PASG6	girlfriend
PASG7	friends
PASG8	relatives
PASG9	colleague
PASG10	children
PASG11	animals
PASG12	other
PASG13	brother or sister
PASG14	girlfriend or boyfriend
	Passengers of the following types which have "bad" effects (ie worse, faster, less safely, concentrate less, more nervous) (430) where:
	1 = no such effect
	2 = "good" effect
PASB1	partner
PASB2	parent
PASB3	brother
PASB4	sister
PASB5	boyfriend
PASB6	girlfriend
PASB7	friends
PASB8	relatives
PASB9	colleague
PASB10	children
PASB11	animals
PASB12	other
PASB13	brother or sister
PASB14	girlfriend or boyfriend

A.9 Statistical modelling methods

The objective of the statistical modelling described in Section 3.5 was to relate the reported 'at fault' accident frequency to the range of explanatory variables so as to try to explain the differences in accident frequency between the drivers. The statistical method used was a form of multiple regression modelling. The method is described with the 'at fault' accident frequency as the dependent variable. The explanatory variables were those of age, sex, mileage, observed behaviour, reported attitudes etc. Since numbers of accidents follow a Poisson error distribution and not a Normal distribution standard least squares regression could not be used. Thus, the generalised linear modelling technique available in the GLIM (Numerical Algorithms Group, 1986) statistical computer package was used since it allows the dependent variable to be drawn from a family of exponential distributions (such as Poisson) and enables non-linear models to be fitted by means of suitable transformations. The technique has been applied previously to a number of similar accident data sets (Maycock and Hall 1984; Maycock, Lockwood and Lester, 1991).

A.9.1 The form of the model

The model of accident frequency fitted was of a general multiplicative form (as successfully used in the previous works) as follows:-

$$A = k\, M^m \exp\left(\sum c_i V_i \right) \quad \ldots\ldots (1)$$

where:

A is the accident frequency (per year)

M is the estimated average mileage (in thousands) per year in the person's driving career

V_i are the explanatory variables of driver experience, age group, sex, attitude, performance and behaviour, and may be continuous variables.

k, m, c_i, are parameters estimated by the regression.

The form of the model permits a non-linear relationship between the accident frequency and average mileage (or exposure) while ensuring that zero accidents are predicted for a zero mileage.

However, in order that the dependent variable may be regarded as following a Poisson error distribution, the above model is multiplied by the number of driving years, Y, as appropriate for each driver to give:

$$AY = k\, Y\, M^m \exp\left(\sum c_i V_i \right) \quad \ldots\ldots (2)$$

so that (AY) is now the number of accidents in the driver's history. Before fitting, the model is transformed to the linear form using logarithmic (base e) transformation to give:

$$\ln(AY) = \ln(k) + \ln(Y) + m \ln(M) + \sum c_i V_i \quad \ldots\ldots (3)$$

The term ln(Y) is known as the 'offset variable', its coefficient being constrained to the value 1.

A.9.2 Significance testing

The model was fitted in a step-by-step procedure starting with the 'null' model which simply fits the mean accident frequency. Variables were tried one at a time in the model and the variable which gave the best fit was selected. At each step the statistic calculated which forms the basis for significance testing was the 'scaled deviance' which is a maximum likelihood ratio statistic (analogous to the residual sum of squares for Normal errors). With Poisson errors, the scaled deviance is asymptotically distributed as a chi-squared variable with (n-p-1) degrees of freedom (where n is the number of data points and p the number of independent variables fitted). Provided the predicted mean value of the dependent variable (accidents in the driver's history) is greater than about 0.5 (Maycock and Hall, 1984), the scaled deviance may be used as a chi-squared variable to test the overall goodness-of-fit of the model.

At each step in the model building process the significance of adding one or more terms to the model also needs to be assessed. Generally, the difference in scaled deviance between two nested models with degrees of freedom df_1 and df_2 will be distributed like chi-squared with (df_1-df_2) degrees of freedom and so may be used to assess the significance of adding terms to the model. Thus, for the addition of one term a value of at least 3.9 is required for significance at the 5% level.

A.9.3 Full model for 'at fault' accident frequency

Full details of the models described in Section 3.5 is given. The models is given in logarithmic linear form in which they were actually fitted (ie. the form of equation 3 above). The fitted parameter estimates are given together with their standard errors which are based on Poisson errors but adjusted by multiplying by the square root of the residual mean deviance (ie scaled deviance of full model/degrees of freedom of full model) to allow for over-dispersion in the fitted models. This multiplier is quite small (1.03) for the 'at fault' accident frequency model which fitted the data very well.

For the model the percentage reduction in explainable scaled deviance is also given as a measure of the overall goodness of fit. Since for a well fitting model the expected value of the residual scaled deviance is equal to the number of degrees of freedom of the model the percentage reduction in explainable scaled deviance is calculated as:

100. (SDn - DFf) / (SDn - SDf)

where:
SDn is scaled deviance of null model
SDf is scaled deviance of fitted model
DFf is degrees of freedom of fitted model

A.9.3 The full model for 'at fault' accident frequency (cont'd)

(1) Model terms		(2) Estimate	s.e.
Constant	Lk	-1.326	0.486
Mileage per year	LM	0.397	0.111
Age group (for group 2)	AGE(2)	-2.614	0.503
differences (for group 3)	AGE(3)	-2.885	0.553
Years (age group 1)	YRS	-0.633	0.157
of (difference for age group 2)	YRS.AGE(2)	0.817	0.170
driving (difference for age group 3)	YRS.AGE(3)	0.661	0.159
Average violation rating	ACTV	0.324	0.082
Average observers rating	OASSA	-0.241	0.068
Proportion with friends	SHAR5	0.862	0.390
Continually too fast	CONF13 (2)	0.365	0.156

	scaled deviance	degrees of freedom
Null model	536.6	331
Fitted 'full' model	337.2	321

Percentage reduction of potentially explainable scaled deviance = 92%

Notes:
(1) The prefix L stands for the $\log_e$ eg $\log_e$ (k)
The factor terms and interaction terms give the difference in the constant and variables respectively for that level of the factor.
(2) The standard errors are based on Poisson errors but adjusted by square root of residual mean deviance to allow for over dispersion in the model.

A.10 Interview topics

Lifestyle

Demography – where do you live?
Educational qualifications?
How much value do you place on academic achievement?
What were your expectations of academic achievement?
What is your job?

1. How self-confident, in general, would you rate yourself compared to someone your own age and sex?

Answers to questions 1-33 were on Visual Analogue scales; for example:

1 X----------------------------------X
Not at all Extremely

2. How conformist, in general, would you rate yourself compared to someone your own age and sex?

. . . .

Leisure

What do you do in your spare time? Hobbies?
What kind of leisure activities do you participate in? Regular exercise? Sports?
How often do you go out per week? Who with?
What would you say is a typical evening or weekend?
Do you smoke? When did you start? (age)
Frequency per week and quantity per occasion (units)
Do you drink?
Have you ever driven after drinking alcohol? In what circumstances? Is it easy to refuse a drink from friends? Do you drink non-alcoholic drinks? What about your friends? Have you ever been a passenger with a drunk driver? Why?

Who taught you to drive? Were they any good? Did you learn to drive or pass the test? Any changes in driving now?
How many and who paid for lessons?
What did getting a licence mean to you? Why?
Was there a gap between training and getting own car/driving regularly?
Any additional driving courses taken? Any you want to take? Under what conditions? How much would you pay? How would you find out about them?
How did you go about getting insurance? Was price the only/main criteria?
What type of insurance policy do you have?
If car owner: How long owned car? How bought? HP? Cash? Loan?
Do you have access to another car?

Parental/friend influence

3. How much do your friends influence you and your behaviour?

4. How much do your parents influence you and your behaviour?

5. What is your parents' driving like?

6. What is the majority of your friends' driving like?

How many are there in your circle of friends?

How do you rate the seriousness (in terms of danger) of the following offences? :-

7. Parking where it is prohibited (ie on double yellow lines)

8. Driving whilst slightly over the blood alcohol limit (BAC)

9. Not complying with traffic light signals (ie a red light)

10. Driving whilst excessively tired

11. Overtaking when it is prohibited by signs or road markings

12. Driving in dark with inadequate lights

13. Exceeding the speed limit by 10 to 20 mph in a 30 mph limit?

14. Driving when the vehicle is overloaded by more than 50%

15. Exceeding the speed limit by more than 20 mph in a 30 mph limit?

16. Driving whilst uninsured

Have you ever been stopped by the police whilst driving? What for? Why?

Risktaking

Estimation of driving ability

17. What are your driving skills of handling and car control compared to other males your own age? Why do you say that?

18. What is your driving safety level compared to other males your own age?

19. What are your driving skills of handling and car control compared to older, more experienced drivers (30+ years)? Why?

20. What is your driving safety level compared to older, more experienced drivers (30+ years)? Why?

What is a good driver? Define a good driver?

A.10 Interview topics (cont'd)

Decision to take risk

17. What are your driving skills of handling and car control compared to other males your own age? Why?

18. What is your driving safety level compared to other males your own age?

19. What are your driving skills of handling and car control compared to older, more experienced drivers (30+ years)? Why?

20. What is your driving safety level compared to older, more experienced drivers (30+ years)? Why?

21. What is your level of risktaking compared to males your own age? Why?

22. What is your level of risktaking compared to older, more experienced drivers (30+ years)? Why?

Have you ever been tempted to try out different risky manouevres in car? When? What type of things? (handbrake turns, rubber burns, etc?) Do you talk to friends about these?
Do you sometimes deliberately take risks for fun or excitement?
Do you ever deliberately break the traffic laws? How often? Why?

Risk perception

23. What do you think are the chances of you being *involved* in a slight injury accident in the next ten years?

24. What are the chances of you *causing* a slight injury accident in the next ten years?

25. What are the chances of you being *involved* in a fatal or serious injury accident in the next ten years?

26. What are the chances of you *causing* a fatal or serious injury accident in the next ten years?

27. To what extent do you think you can drive fast quite safely?

28. How likely are you to be stopped and charged if you were speeding? If they have been stopped: How effective is a verbal warning? How effective are points on your licence? Why?

Passengers and other drivers

Do you drive differently with different passengers? In what ways? Who with?
Girlfriend? Why? What do they say? Pressure to drive in a certain way?
Do you prefer to drive than be driven? Why? Who with?
Do you ever have problems with drunk passengers?

29. To what extent are you affected by other driver actions on the road? In what ways? Ever raced? Circumstances? What would have made you? Have you ever tried to beat a time to get to a particular place?

Effect of radio?

What type of stereo? Output?
Precise type of music in different circumstances? How do you choose the music? Any effect?

Effect of mood?

30. To what extent does mood affect your driving? In what ways?

31. To what extent do other drivers affect your mood? Ever made signs? Often?

Interest in cars?

Are you a fuel saving driver? Do you maintain a regular speed or put strain on the engine?
Are you a competitive driver?
Do you own your car? Do you spend much money on cars?
(eg petrol, repairs)
Does it bother you?
Do you spend much time working on your car? In what ways? Bodywork? Engine? Cleaning?
If fanbelt broke could you fix it? Change a wheel? How often do you check the tyre pressure and oil? How often do you get the car serviced?

32. How much do you talk with friends about cars and driving?
Are you interested in motor sport? What sort? In what ways?

Car choices

Is the car more than a means of transport? Why?
Why your present car? After price . . .? How much did it cost? How long owned?
If we gave you another car would you drive differently?
Is the image important? Where does a car get an image? Is the car a status symbol?

A.10 Interview topics (cont'd)

Media, film, adverts

How do you think the media (film, TV) portray the car? Good, bad, realistic light?
Do you think the portrayal of the car in the media ever affects driver behaviour? Do you think you are affected?
What do you think of car adverts? Any you remember? Why? Which are effective?
Do adverts/ media determine the status/image of a car?
Are there any cars you wouldn't want to drive? Why? Other than utility?
Name a car that you think is particularly safe?

Knowledge

How much information on road/driver safety have you ever been given? Who by?
Did you read it?

33. How much do you worry about having a traffic injury accident? Why?

How many traffic injuries per year do you estimate there are in GB?
How many deaths per year?

34a. What percentage of these traffic injuries per year in G.B.involve:-
car drivers/passengers?
pedestrians?
cyclists?
motor cyclists?
HGV/bus drivers or passengers?

34b. What percentage of accidents do you estimate are the fault of the driver, the vehicle or the road environment or some interaction/combination of these?

One of the more common accidents for young male drivers is a SVA (single vehicle accident) with no other car involved often on a rural road in the evening and yet this is one of the less common types of accident for other age and sex groups. Any ideas why this is so?
Have you been involved in any accidents? What were the details? Were they your fault?

Assessment of own driving and possible measures

Do you think your driving is a reflection of your personality?
eg. Are you a patient or impatient person/driver?
Do you deliberately drive unsafely? . . . but you break the traffic law?
Isn't that a contradiction? Why?/Why not?
Do you feel comfortable driving a car? Why? When don't you?
Any suggestions that would make people drive more safely?
Would it work for you? Would you welcome such measures?
Would it bother you if someone told you you were a bad driver? Who would it bother you the most? Friends? Parents? Police?
How do you feel young male drivers are viewed as drivers by other 'groups' of people/drivers? Does it bother you? How do you react?
Anything else you would like to add, that we haven't covered?
Thank you for all your help.