TRANSPORT RESEARCH LABORATORY

The characteristics of speeders

Prepared for Road Safety Division, Department of the Environment, Transport and the Regions

D C Webster and P A Wells

TRL REPORT 440

First Published 2000
ISSN 0968-4107

This report has been produced by the Transport Research Laboratory, under/as part of a Contract placed by the Department of the Environment, Transport and the Regions. Any views expressed are not necessarily those of the Department.

TRL is committed to optimising energy efficiency, reducing waste and promoting recycling and re-use. In support of these environmental goals, this report has been printed on recycled paper, comprising 100% post-consumer waste, manufactured using a TCF (totally chlorine free) process.

Transport Research Foundation Group of Companies

Transport Research Foundation (a company limited by guarantee) trading as Transport Research Laboratory. Registered in England, Number 3011746.

TRL Limited. Registered in England, Number 3142272.
Registered Offices: Old Wokingham Road, Crowthorne, Berkshire, RG45 6AU.

CONTENTS

Executive Summary

TRL is carrying out research aimed at identifying how speed management policies can be improved to achieve better speed compliance. A key objective of the work is to link together an understanding of speed and accident risk so that balanced strategies can be developed which integrate education, enforcement and road design. As part of this work there is a need for a general understanding, at the individual driver level, of the sorts of things which influence speeding behaviour. A number of studies have been carried out in the past to identify the characteristics of speeders and this report presents a literature review of these studies which brings the key findings together into one document. The questions which remain are less about the characteristics of the drivers who speed than about how to change their behaviour in terms of their speed choices.

The research shows that many different people are speeders and a majority of drivers admit to speeding at some times. However, more speeders are younger males, in non-manual occupations. Company car drivers and drivers covering high annual mileages are more likely to drive faster, as are drivers travelling alone. The faster drivers tend to be in the younger age bracket; about 40 years old is the transition when drivers become 'less likely' to speed.

Passengers affect speed choice, with most drivers choosing slower speeds when carrying passengers, but higher speeds are associated with young drivers carrying young male passengers.

Amongst psychological measures, the 'violation scale' predicts speed behaviour, as does mild social deviance, and despite a general opinion that speed causes accidents, there may be an irrational element to speed choice when circumstances permit it. Driving style and violation scores were both correlated with relative speed (i.e. speed relative to the mean speed at a location) such that careful, placid drivers were relatively slower and violators tended to be faster. Drivers' physical condition (eyesight, reaction times) is associated with slower speeds but only in so far as these elements are associated with increased age.

Drivers' reaction times in a hazard perception test are not correlated with speed choice but hazard perception training has been shown to result in drivers choosing to drive more slowly.

Drivers justify their personal speeding choices by assuming that they are 'ordinary, safe speeding drivers' while others are 'dangerous speeding drivers'. Drivers may also justify speeding by assuming that limits are unrealistic.

A number of studies have examined the relationship between speed and accidents. A figure of between a 2% and 7% reduction in accidents per 1 mile/h reduction in mean traffic speed holds for the range of speeds typically found on urban roads. The relationship between the percentage of drivers exceeding the speed limit and the number of accidents on a particular road, and the relationship between the accident liability of individual drivers and their individual speeding behaviour, suggest that both speed in excess of the speed limit, and speed greater than the average for the situation, are critical factors.

Research suggests that penalties, or the fear of penalties, can reduce speeding but penalties need to be perceived as fair. Speed cameras can act as an effective deterrent to speeding, though there is widespread belief that many fixed camera sites are not operating. Some drivers will continue to believe that their personal speed choice is safe and will slow down only when passing the camera site and accelerate to their preferred speed after it. Embarrassment at being stopped for speeding may act as a deterrent. Higher fines and penalties decrease the likelihood of drivers speeding, though high speeders do not appear to be deterred by current levels of penalty.

Knowledge of the 30 miles/h limit in town centres and the 70 miles/h limit on motorways is good, but these are the roads where a high percentage of vehicles exceed the limit. Drivers are confused by the 40, 50 and 60 miles/h limits and compliance is poor, possibly because drivers are unable to 'read' the limit from environmental cues and speed limit application may not be consistent between roads or areas. There are also problems where the limit for a particular vehicle is lower than the posted limit on the road.

The review suggests that publicity, training and engineering measures will all have a role to play in addressing the problem of speeding drivers.

It is likely that publicity programmes to change attitudes to speeding will need to develop a message which, as with alcohol publicity, contains a sequence of elements including: acceptance of the risk; recognition that risk is associated with ones own speeding and is therefore within ones own control; understanding the consequences of speeding on oneself and others.

The use of training to inform new drivers of the consequences of excessive speed may be one way to tackle the problem of the young drivers who are prone to speeding. Training in hazard perception could be used to reduce speeding behaviour and more training courses for company car drivers could reduce speeding in this group. Training could also ensure that drivers of vehicles with specific speed limits know what those limits are.

Other solutions include greater use of speed limiters in vehicles, the use of roadside beacons to either indicate or impose speeds at particular sites (e.g. bends), more use of camera technology (especially mobile units) for identifying speeders, the use of vehicle activated signs to target specific drivers and particular locations, and road designs which help drivers to recognise the appropriate speed for a given road.

1 Introduction

TRL is carrying out research aimed at identifying how speed management policies can be improved to achieve better speed compliance. A key objective of the work is to link together an understanding of speed and accident risk so that balanced strategies can be developed which integrate education, enforcement and road design. As part of this work there is a need for a general understanding, at the individual driver level, of the sorts of things which influence speeding behaviour. A number of studies have been carried out in the past to identify the characteristics of speeders and this report presents a literature review of these studies which brings the key findings together in one document.

The report considers the characteristics of speeders in terms of their demographic and psychological characteristics (Section 2). It then examines the evidence on the relationships between personal characteristics and accidents (Section 3). The effects of speeding penalties and deterrence are considered in Section 4 and Section 5 looks at where speeding occurs and considers some of the issues for non-car drivers. Section 6 brings together the key findings and Section 7 suggests possible means of changing speeding behaviour.

2 Personal characteristics of speeders

A number of studies have been carried out which examined personal characteristics in relation to speed choice.

A major source of information on personal characteristics comes from a questionnaire study of 5000 car drivers carried out by Quimby et al (1999a). Unobtrusive speed measurements were taken of a sample of vehicles on a variety of (non-motorway) roads when the vehicles were in free flow conditions (i.e. their speed was not constrained by congestion). A sample of drivers were identified from their license plates and sent a self completion questionnaire which asked for information about the trip being undertaken when observed, some personal information and information on accidents in the previous three years. The respondents were also asked to rate themselves on a total of eight psychological scales. (Some examples from the scales are shown in Appendix A.) The scales used in this study were:

- Decision making style.
- Mild social deviance.
- Violation scale.
- Sensation seeking.
- Intolerance.
- Driving stress.
- Hazard involvement.
- Driving style.

It was found that the *absolute* observed speeds of drivers were strongly dependent on the site characteristics. Drivers were therefore defined in this study in terms of their speed relative to the geometric mean speed at the site rather than by their absolute speed. Overall the study showed that faster drivers (relative to the mean) tended to be young, to drive high annual mileages in large cars (i.e. those with engine sizes of 2000 cc or more) and they tended to be travelling alone when observed.

An in-depth study of speed choice followed up a sample of drivers from this study. The majority of drivers were from the two extremes of the speed distribution found in the initial sample. The 116 subjects were asked to drive round a test route in their own car which had been fitted with apparatus designed to monitor their driving (Quimby et al, 1999b). They were told they were helping in the evaluation of some new test equipment and that they should drive normally. It was found that speed choice (relative to the mean) tended to be consistent in all situations.

Another study (Lipscombe and Wilkinson, 1996) utilised police information about over 2000 speeding offences committed in Scotland in 1993 and related speeding on Scottish roads to a number of variables such as age, sex and occupation. Overall they found that the worst speeding offenders on Scottish roads were males in the age group 21-29 years old with non-manual jobs.

Other studies have examined attitudes to speeding (SARTRE 2, 1998); drivers' acceptance of speeding as a crime (Corbett et al, 1997a); the influence of speeding penalties; deterrence effects (Corbett et al, 1998); remedial strategies (Parker et al, 1998); and factors affecting speed choice (Silcock et al, 1999). Stradling (1999) also summarised many of the factors which relate to speed choices.

The results from these studies have been combined to develop an overall picture of the interaction of personal characteristics and speeding behaviour of drivers.

2.1 Demographic characteristics of speeders

Silcock et al (1999) found that 85% of drivers in their questionnaire survey admitted to speeding on occasion, and that there was general agreement that everyone did it. However there were differences between groups in this and other research, as now explained.

2.1.1 Age and sex

Quimby et al (1999a) used a regression analysis of individual driver speeds relative to the site mean speed to show that the variable which best predicted the speeds of drivers was age (11% effect size between the 5th percentile and 95th percentile ages observed). Age remained a strong predictor of relative speed even when other variables were included in the analysis. This study found that the overall difference between the sexes was not statistically significant. However, in a similar study, Maycock et al (1998) found that age and sex were both important variables in distinguishing speeders (see Table 1).

Lipscombe and Wilkinson (1996) in their study of Scottish speeders found that males were twice as likely to commit minor speeding offences and four times as likely to commit a more serious speeding offence than females. Males were more prone to speeding than females regardless of road type, with the most marked difference being on rural roads. Males were also almost twice as

Table 1 Distribution of sample by age group and speed band

	Percentage of drivers		
Age group	*Slow*	*Fast*	*Number*
Males			
17-29	15	28	513
30-39	16	28	848
40-49	18	22	1047
50-59	24	15	905
60+	32	9	1027
All ages	22	19	4340
Females			
17-29	23	21	317
30-39	18	15	405
40-49	25	15	383
50-59	26	11	308
60+	32	7	226
All ages	24	15	1639

likely to speed as females during leisure periods and were even more likely to speed during peak periods and working hours.

They also showed that minor speeding offences were inversely related to age, except for the youngest age group (16-20 years), who were less likely to speed overall than 21-29 year olds. About 40 years old is the transition age when drivers become 'less likely' to speed.

The 21-25 age group was most prone to speeding on all roads with the exception of motorways where the 26-29 age group were the worst offenders. The 21-25 age group had the greatest propensity to speed during all periods except during daytime hours at weekends when those in the 26-29 age range were more likely to speed. The youngest age group displayed the greatest variation in propensity to speed by time period, with the nights and evenings the most likely period for them to commit an offence.

Although these results all show that speeding is age related, Stradling (1997) has warned that characterising speeding drivers as young can be counter-productive because it can alienate the responsible young drivers who should be used as role models.

The Silcock et al (1999) result showing that speeding is not confined to stereotypes such as 'boy racers', but is something which almost all drivers do at some time, is important when discussing countermeasures. (It may be convenient, however, for drivers to blame other stereotypes.) While younger drivers may speed more often, it should be remembered that there are more of the older drivers and their speeding behaviour also needs to be addressed.

2.1.2 Occupation/socio-economic group

Quimby et al (1999a) showed that occupational group was a predictor of speeding behaviour (senior managers drove 1.4% faster than junior managers or manual workers and 2.8% faster than housewives/husbands, students or the unemployed). Maycock et al (1998) also found that managerial drivers were the fastest drivers and retired drivers were the slowest. Company car drivers were 2.7% faster than private car drivers, all else being equal. In the Lipscombe and Wilkinson (1996) report on Scottish speeders, non-manual workers displayed the greatest propensity to commit speeding offences and manual-unskilled the lowest propensity of the work force.

2.1.3 Annual mileage

Quimby et al (1999a) showed that annual mileage was the second most important factor in predicting drivers' speed (2.7% effect size between the 5th percentile and 95th percentile mileages observed). However, the annual mileage effect became non-significant when other variables were included.

Maycock et al (1998) found that low mileage drivers (under 5000 miles/year) were more likely to be in the slow speed band and high mileage drivers (over 25000 miles/year) were more likely to be found in the fast speed band.

Lipscombe and Wilkinson (1996) showed that in Scotland employees covering 'high mileages' were more prone to speed than others.

2.2 Psychological characteristics of speeders

When Quimby et al (1999a) used psychological variables to predict speed, the largest positive association arose from the violation scale (an 8% effect size between the 5th percentile and 95th percentile speed observed). Mild social deviance (which is correlated with violation score) was also a positive speed predictor and provided some additional explanatory power (1.4% effect size) though social deviance ceased to be significant when age and other explanatory variables were added. The sensation seeking scale was a significant positive correlate of speed for male drivers only. This study also suggested that drivers who find driving stressful drive slightly slower than those who do not.

In the follow-up study (Quimby et al, 1999b) driving style in the test drive and violation scores were both correlated with relative speed such that careful, placid drivers were relatively slower and violators tended to be faster.

It was also reported (Levelt, 1998) that when youthful drivers feel angry they tend to speed and that sensation seeking behaviour is a largely hereditary, biologically anchored characteristic.

Stradling (1999) suggests that speeders tend to rate the potential adverse consequences of their actions (such as having an accident, being stopped by the police) as less likely and less bad compared to other drivers. They also over-estimate the number of other drivers who speed.

2.2.1 Attitudes to speeding

The Social Attitudes to Road Traffic Risk in Europe project (SARTRE) used questionnaires sent to drivers across the European Union to examine drivers' attitudes and perceptions. SARTRE 2 was a follow-up study carried out 5 years after the original SARTRE 1. Table 2 shows some of the results relating to speed (SARTRE 2, 1998).

There are differences of detail between the opinions of different groups (age, sex, lifestyle etc. will all affect opinions) but it is important to note that driving too fast (often, very often and always) was in general regarded as a cause of accidents. Similarly other drivers were thought to

Table 2 Percentages agreeing with statements relating to speed in SARTRE 2 survey compared with the SARTRE 1 survey

	SARTRE 2		*Change between SARTRE 1 and SARTRE 2*
	UK	*EU Average*	*UK*
Driving too fast causes accidents	86	79	0
Other drivers exceed limits	93	82	-2
Own speed faster than average	22	21	-2
Enjoy driving fast	4	9	-8

exceed limits (often, very often and always) by 93% of UK drivers, a slight reduction since the SARTRE 1 survey. There was also a slight reduction in the percentage of UK drivers who thought that their own speed was faster than average (much faster or a little faster). A total of 4% enjoyed driving fast (very fast) which is markedly lower than was found in the SARTRE 1 survey.

Corbett (1997a) has shown that the attitudes of magistrates, traffic police and driving instructors who admitted to speeding were similar to 'ordinary' drivers who do not have such a public role in defining attitudes to speeding.

Reason et al (1991) surveyed drivers and showed that speeding was not seen as being a particularly serious offence and was thought to be less serious than drinking and driving or dangerous overtaking. A more recent survey for the Scottish Office (Scottish Office Central Research Office, 1994) found a similar result, with only one in six Scottish drivers considering that exceeding the speed limit by 10 miles/h is a serious offence.

Silcock et al (1999) found that respondents to their surveys distinguished the 'ordinary, safe speeding drivers' from the 'dangerous speeding drivers', in order to justify their own speeding behaviour. 'Serious speeding' is accepted as dangerous but 'moderate speeding' is not and 'my' speed choices are safe.

Some review studies appear to give conflicting results or they could indicate that the views of people are changing (Levelt, 1998). For example Levelt reported a study in 1989 where local residents ignored their local regulations because they felt that they were intended to control the through traffic and did not apply to local traffic. However Levelt reported in 1994 that local inhabitants wanted lower speed limits and lower speeds with more strict police enforcement.

Rienstra and Rietveld (1996) suggest that for Dutch drivers deliberate transgression of the posted speed limit is fairly low in built-up areas and that reduced speed limits would be acceptable on safety grounds on these roads. However speed reductions in non-built-up areas would not be acceptable. This is supported by results from the SARTRE project where only 3% of Dutch drivers (and 4% of UK drivers) wanted to see an increase in speed limits in urban areas but 40% of Dutch drivers (and 44% of UK drivers) would like to see motorway speed limits increased (SARTRE 2, 1998). More recently, Silcock et al (1999) found that a majority of their respondents supported the 30 miles/h limit in general with a substantial minority suggesting that speed limits could go down to 20 miles/h. However, over one third would like to see motorway limits increased.

Reason et al (1991) suggest that the perception that speeding is a less serious offence than other driver offences is related to drivers' perception of being in control. Another result from Silcock et al (1999) is that drivers justify speeding because they believe themselves to be sufficiently skilled and sufficiently experienced to do so safely. They also believe that the braking performance of modern cars allows safe high speeds.

2.2.2 The rationality of speeding decisions

It is usually assumed that there is a rational basis to behaviour and that people can therefore be persuaded to choose certain behaviours by showing them reasons for that choice. This is the basis of the idea that knowledge of penalties will have a deterrent effect. However, a form of irrationality, termed akrasia, has been proposed to explain some apparently irrational behaviour.

A person shows akratic behaviour (Corbett, 1997b) when, in order to gain benefit, they decide to carry out action Y despite earlier considered judgement that action X (which conflicts with Y) would be better. An everyday example would be failing to stick to a diet. Akrasia therefore demonstrates weakness of will where long term, rational principles and decisions are overturned at the moment of choice on account of short-term gratification or temptation based on visceral or emotional reasons. This might explain some situations in which drivers behave uncharacteristically. Akratic behaviour is intentional and it is therefore deemed to be irrational.

Corbett (1997b) studied a sample of 94 drivers' reasons for 'only rarely' going faster. It is not surprising that 71% do so when in a hurry. It is interesting that 63% do it without realising it and therefore it is not akratic behaviour because it is not planned or intentional. The other strong akratic behaviours are 'going against my better judgement' (23%), 'at the last moment, temptation gets the better of me' (9%) and 'I'm just weak-willed' (9%).

The main conclusions from the study were that drivers who behaved akratically were hardly distinguishable from other drivers on dimensions shown to be associated with general speeding behaviour e.g. age. Neither were they distinguishable from others based on the reasons for not speeding. If some speeding decisions are made on the spur of the moment then they are not open to deterrent reasoning. It is also possible that such instances of uncharacteristic speed are liable to higher accident risk because the decision to speed was not a conscious, rational choice and was not based on judgement of the situation.

Rienstra and Rietveld (1996) found that respondents in their questionnaire study of Dutch drivers said that transgressing speed limits was often not deliberate, but that their speed increased unconsciously. These drivers also said that they speeded to save time, especially on roads with a higher speed limit.

2.3 Other characteristics of speeders

2.3.1 Static and kinetic visual acuity

Static and kinetic acuity were measured in Quimby's follow up study (Quimby et al, 1999b). Both static and kinetic visual acuity decline with age but neither is associated with speed once the age effect has been eliminated.

2.3.2 Hazard perception

Horswell and McKenna (1997) used a non-interactive video simulator to assess the effects of hazard perception training. Drivers were asked whether they would drive each section of the simulation at the speed driven in the video or whether they would drive faster or more slowly, making a numerical estimate e.g. +10 miles/h or –5 miles/h. Drivers who had received hazard perception training selected slower driving speeds than those who had not been given the training. Thus it appears that the training decreased this form of risk taking.

Quimby et al (1999b) used the TRL hazard perception equipment which consists of a video recording depicting the driver's eye view of the road. Subjects were required to continuously position a response lever which indicated the level of risk that they could see on the video. Hazard perception reaction times were correlated with age but were not related to speed choice. Thus speed appears to be independent of hazard perception performance, but nevertheless to be affected by training.

2.3.3 Effect of perceived control

Many drivers believe that they are 'fast but safe' and have a high opinion of their own driving skills (Parker et al, 1995). Corbett (1997a) looked at a sample of 104 fast drivers. Fast drivers chose the speed at which they felt in control or safe. As expected, the fastest drivers felt the most invincible, illustrating the considerable illusion of control among this type of driver. Even when accidents happened many felt that they still retained some control over the unfolding of the accident scenario.

Horswell and McKenna (1997) used their video simulations to show that drivers chose significantly faster speeds when they were asked to consider themselves as 'driving' the simulation than when they considered themselves as passengers. They also discussed earlier research which showed that making drivers observe a blameworthy accident resulted in a change of speed. They suggested that this could be a result of a decrease in the drivers' perception of their own skill and ability to control the situation.

Silcock et al (1999) suggested that the improved brakes on modern cars give drivers the feeling that they have more control, particularly in high performance cars.

Stradling (1999) found that speeders tend to consider themselves to be better drivers than others. The ability to control the vehicle is one aspect of being a good driver. Fifty-six percent of the respondents to the questionnaires used by Silcock et al (1999) judged themselves to be average drivers but only 4% defined themselves as below average while 8% thought they were 'well above average' and 30% judged themselves as 'a bit above average'.

2.3.4 Passengers/noise in car/comfort in car

Quimby et al (1999a) found that drivers with passengers (35% of the drivers observed had a passenger in the car) drove somewhat slower on average than those without. The differences were statistically significant.

McDonald et al (1992) found that young men were more likely to choose slower speeds when driving with parents, an adult or a girlfriend. McKenna et al (1998) also found that young men drove more slowly with young women passengers, but the presence of young male passengers was associated with faster driving.

Horswell and McKenna (1997) tested auditory feedback by means of video simulation and found that those exposed to higher noise levels drove slower than those exposed to lower noise levels. The implication is that newer, quieter cars may lead to drivers going faster without being aware of their speed. Silcock et al (1999) also showed that their respondents found driving in powerful, quiet cars led to unintentional speeding.

In this context it is interesting to consider the results from a study which compared the accident records of various car models (Broughton, 1996) which showed that larger/heavier cars were safer for the occupants. This result is not surprising but it could influence some drivers of larger cars when they make safety decisions such as whether to speed or not, particularly if the main threat is from other, smaller cars. Quimby et al (1999a) showed that driving a large car influenced speed. A study by Horne and Reyner (1997) suggests that the overall comfort, the layout of the controls and sound reduction in modern cars could be contributing to the fact that many speeders are in larger cars which do not communicate the speed back to the driver, particularly on motorways.

2.3.5 Knowledge of speed limits

Silcock et al (1999) found that while there was good knowledge of the 30 miles/h urban limit and 70 miles/h motorway limit the use of intermediate speed limits was poorly understood and viewed as inconsistent. Drivers were unable to 'read' the road design to assess what the limit was and they failed to notice speed limit signs.

2.3.6 Other factors

Parker et al (1998) found that those who commit driving violations, including speeding, overestimate the numbers of people who speed and this may act as a means of justifying their behaviour. It was noted that speed limits are sometimes perceived to be unrealistic and this can encourage some drivers to ignore speed limits. Silcock et al (1999) also found that their respondents believed that some roads were 'suitable' for higher speeds than the posted limits, especially when traffic was sparse.

Maycock et al (1998) showed that good decision makers had longer reaction times and high violators had shorter reaction times.

2.4 Summary

The research shows that many different people are speeders and a majority of drivers admit to speeding at

some times. However, more speeders are younger males, in non-manual occupations. Company car drivers, drivers in large cars, and drivers covering high annual mileages (over 25,000 miles/year) are more likely to drive faster. Speed choice (relative to the mean) tends to be consistent in all situations. The 'violation scale' (see Appendix A) predicts speed behaviour, as does 'mild social deviance', and despite a general opinion that speed causes accidents, there may be an irrational element to speed choice when circumstances permit it. Drivers' physical condition (eyesight, reaction times) is associated with slower speeds but only in so far as these elements are associated with increased age. Drivers may justify speeding by assuming that limits are unrealistic. Younger drivers' speeding behaviour is the most likely to vary by time of day.

3 Personal characteristics and accidents

Any data relating speed to accidents and speeders to driver behaviour rely heavily on the accuracy of the measurements and the questionnaire designs which are employed to investigate the effects. It is clearly difficult to be very precise about the actual effect of speeding because accidents are caused by a chain of events which can be broken at any time (DOT, 1986). It is inevitable that inappropriate speed for the conditions is often a cause of accidents because reactions have to be quicker at higher speeds and this is when chance plays a large part in whether an accident happens or not. A driver who avoids an accident may consider that their 'skill' avoided the accident but often they can just be 'lucky'. It should be remembered that while the driver may consider that 'I avoided that accident by driving skill', onlookers would describe it as 'the driver was lucky to avoid an accident'. The aim is to minimise all of the accident contributory factors, of which inappropriate speed is just one.

Much research has been done on the effect of speed on accidents. So called 'before-and-after' or 'longitudinal' types of study on the same road under different conditions have produced relatively consistent estimates of the effects of traffic speed on accidents. Such studies often show that speed does indeed kill (Finch et al, 1994; Webster and Mackie, 1996). Finch et al (1994) showed that a reduction of 1 mile/h is associated with roughly a 5% accident saving across a range of road types. More recent research by TRL (Taylor et al, 2000) suggests some variability in this figure for different road types and mean speeds – across the range of speeds typically found on urban roads the figure is between about 2% and 7%. The 5% figure remains a good rule of thumb for those roads most in need of treatment.

The results from a questionnaire sent to readers of a road safety publication in the USA (Graham, 1997) showed that 83% thought that speeding is the major contributory factor in traffic crashes and fatalities.

3.1 Forgotten accidents

A study by Chapman and Underwood (1997) found that 80% of near accidents may be forgotten over the course of just 2 weeks. This is potentially a concern but it may not be a problem if the driver learns from the experience and can then anticipate potential accidents and adjust speed accordingly. It does, however, suggest that there may be a similar problem for minor accidents. The majority of accidents reported by drivers in the Quimby et al (1999a) study were damage only (only 13% involving injury). This is the type of accident which may be the most likely to be forgotten.

Maycock et al (1991) discussed the phenomenon of forgotten accidents over a 3 year period. They noted that there were more accidents reported by their sample in the most recent year compared with the previous year and the year before that. Earlier work had shown that drivers gradually forget accidents that occur and it was noted that drivers in occupational classes A, B and C1 and those who drove a lot in the dark were more likely to forget accidents. Forgotten accidents could therefore have an effect in any questionnaire whch relies on drivers giving recalled data.

3.2 Behaviour which affects accidents

Quimby et al (1999b) describe a model which relates accident liability of a car driver to an exponential function of age and other explanatory variables (V_i). The equation takes the form:

$$A_3 = kM^{\alpha} \exp(a_1 AGE + \Sigma a_i V_i)$$

where A_3 is the accident liability (*all* accidents during a 3 year period); M is the annual mileage driven; AGE is the driver's age at the midpoint of the accident period; k, α and the a_i's are coefficients to be determined from the analysis.

Using this form of model they showed that the number of accidents reported by drivers was significantly correlated with the experimenter's assessment of speed setting ability during a test drive. The results showed that the better the driver's choice of speed as 'appropriate to the conditions' the higher was the driver's accident liability. This counter-intuitive result may occur because 'good speed setting' is associated with fast driving, which is, itself, associated with higher accident liability. The number of reported accidents was also correlated with the driver's mean hazard reaction time on the hazard perception test.

Maycock et al (1998) showed that accident liability increases with both annual mileage and the frequency with which trips are made but that it does not increase in proportion to exposure, tending to flatten off at high levels of exposure. Speed was also shown to be a predictor of accident liability. Maycock developed the following relationship between speed and accidents:

$$A_3 = 0.265\ S^{13.1}$$

where A_3 is the accident liability of an individual driver (as above) and S is the predicted speed ratio - the predicted ratio of the individual's speed to the geometric mean speed (assumed constant between sites) – for that driver.

Quimby et al (1999a) developed an equivalent relationship from their study, which was:

$$A_3 = 0.215\ S^{7.8}$$

These models represent associations between the variables, which may arise from a causal link between speed and accidents, or from causal links between accidents and a number of key variables (age or mileage for example) and between speed and the same variables.

The correlation between speed limit violation and accidents has been shown to be positive. Taylor et al (2000) report that on urban road sections accident frequency increases by 19% for every 1 mile/h increase in the mean excess speed (i.e. the mean speed in excess of the limit of those exceeding the limit), assuming everything else is constant. The accident-speed model is given by:

$$A = k\, P^{0.141} \exp(0.175\, V_{ex})$$

where A is the annual accident frequency; P is the proportion of drivers exceeding the speed limit; V_{ex} is the mean excess speed; k depends on traffic flow, pedestrian flow, the number of minor junctions, the percentage of large vehicles in the traffic, and the road class. A model for rural single-carriageway roads has also been developed (Taylor et al, 2000) which shows that accident frequency increases with an increasing proportion of traffic above the speed limit.

Both models show that the proportion of 'speeders' on a road will influence the accident frequency for that road. This does not *necessarily* mean that it is these speeders who are involved in the accidents but the Maycock et al and Quimby et al formulae above suggest that individuals who drive at high speeds are those with the high accident involvement over three years.

3.3 Psychological variables which are associated with accidents

Quimby et al (1999b) showed that accidents were correlated with results on the violation and intolerance scales as measured in their earlier survey (Quimby et al, 1999a). In both studies driving style as assessed by means of a questionnaire was shown to be correlated with accidents.

Parker et al (1995) used the Driver Behaviour Questionnaire (DBQ) (Reason et al, 1991) which relates self-reported behaviour involving driving errors, driving violations and driving lapses, to accidents. High scores on the violations scale were associated with accidents in general and particularly with active loss-of-control accidents and passive right-of-way accidents (the distinction between passive and active was based primarily on whether the reporting driver would be likely to be held responsible in law). One aspect of the violations scale is fast driving speed and this may be a factor in loss-of-control accidents. Parker et al suggest that drivers with high violation scores may fail to appreciate the potential danger of a vehicle edging out of a turning, thus increasing the chance that they will be the 'victim' of a passive right-of-way accident.

3.4 Company car drivers and accidents

Company car drivers have sometimes been thought to be responsible for speeding and hence accidents. Lynn and Lockwood (1998) showed that they do have slightly more accidents when driving for work compared to non-work driving. In total, company car drivers had 49% more accidents than 'ordinary' drivers, even when exposure differences and differences in demographic variables had been allowed for. However, there was no detail on how many of these accidents might be speed related.

Training courses for company car drivers has been shown to have beneficial effects in terms of accident reduction (Lynn and Lockwood, 1998). This may, in part, be due to better informed speed choices by these drivers.

3.5 Summary

All the research described in this section suggests that speeding behaviour is associated with accidents. In particular the relationship between the number of drivers exceeding the speed limit and the number of accidents on a particular road, and the relationship between the accident liability of individual drivers and their individual speeding behaviour, suggest that both speed over the speed limit, and speed over the norm for that road, are critical factors.

4 Effects of speeding penalties and deterrence

4.1 Penalties

An unpublished study by Finch showed that it was important for speeding penalties to be perceived to be fair. Drivers were 2.8 times more likely to be responding to punishment and still driving more cautiously after 12 months if they felt the punishment was fair (or vice versa). The majority of drivers (94.5%) felt that verbal warnings were fair, though only 47% of those who received a fine and/or penalty points felt similarly. Males were 2.5 times more likely than females to state that their punishment was unfair. The majority of drivers (65.5%) believed that there should be no cash alternative to disqualification, which tends to support the notion that disqualification is the prime motivation for compliance.

Holland and Conner (1995) looked at speed choices for drivers using a road on which police roadside warning signs ('Police Speed Check Area') were introduced, removed and re-erected over a 13 week period. For one week of this period there was also heavy and active police presence and a number of people were apprehended for speeding. The effect of signs with no recent police activity could thus be compared with the effect when there had been recent activity, and with the baseline of no signs or activity. The signs, with their implied threat of catching and penalising speeding drivers, coupled with the one week of actual police activity, had a substantial and reliable effect in reducing the percentage of drivers exceeding the speed limit.

The study involved speed measurements throughout the period as well as the use of questionnaires handed out before the initial erection of signs, and again after the signs had been up for 4 weeks (including the week of high police activity). Overall with the signs alone (no recent police activity) the number of drivers exceeding the limit by 5 miles/h was

63.8% of those doing so before the signs. In the week with active police presence the proportion of speeders was only 41.4% of the baseline figure, and with signs a week after the police activity it was 54.6% of the baseline figure. However a week later this had risen to 79.2%.

The questionnaire examined drivers' intention to speed. The results showed that young men (under 25 years old) appeared to have stronger intention to speed generally in the 'after' period, but young women (under 25 years old) showed a significant reduction in their intention to speed as a result of the intervention.

Quimby et al (1999a) found that drivers who had been warned by the police or prosecuted for a motoring offence drove faster than those who had not. Drivers with more than 3 points on their license drove faster than those with fewer than 3 points on their license. These associations are likely to derive from the faster drivers being more likely to be the subject of enforcement action (58% of those warned by the police and 81% of those prosecuted were for speeding offences).

Corbett et al (1998) reported a 'deterrence game'. The game was presented to fast drivers who were under 21 years of age, drove as part of their job or drove a high performance/sports car. The game contained statements such as 'The chance of being caught if doing 40+ miles/h is ONCE IN 5 YEARS'. The drivers were then presented with 7 categories with increasing penalties and were asked to fill in the speed range that they would drive at together with how often they would be in the given speed range. The most interesting result from this report was that magistrates were like ordinary people in their attitude to speed limits and exceeding them, although the weight of their professional role tended to curb the majority. Those having a professional input into the regulation of speeding were apt to be indistinguishable from ordinary drivers – deciding for themselves what was a safe speed for the circumstances and many thinking that speeding was not criminal. This appears to show that speeding in itself is not regarded as wrong but 'inappropriate' speed is regarded as wrong.

West (1997) showed that anti-social motivation is an important focus on interventions aimed at reducing accident rates, not just in individuals who come before the courts, but among the population of drivers as a whole. Attempts could be made to raise the extent to which society views anti-social behaviour such as excessive speed and close following which account for 30% of accidents. Individuals high in anti-social motivation might be less likely to respond to appeals to modify their driving behaviour for the sake of other road users. However they may respond if they felt that their own self interest was threatened.

4.2 Fear of penalties

A roadside study of speeders caught by the police (Corbett, 1997a) showed that two-thirds of those stopped did not feel guilty and only a quarter accepted that they had committed a crime High speeders did not fear being caught because the perceived penalty was low. Moreover, some persistent speeders were not deterred by previous experience of disqualification.

In Finch's unpublished study, 74.2% of drivers claimed that they would be embarrassed if the police stopped them for driving. Finch suggests that this is because most drivers like to think of themselves as law-abiding and are embarrassed when this myth is exploded.

4.3 Deterring high speed drivers

Corbett (1997a) also looked at a sample of 104 fast drivers. For these drivers the fear of penalties or risk of being caught appeared to be outweighed by their belief in their control of the situation. However Corbett also found that fast drivers would decrease the frequency of their speeding if the risk of being caught or the penalty for speeding was increased to a much higher level.

4.4 Effectiveness of speed cameras

Silcock et al (1999) found that over half the respondents of their questionnaire survey thought that speed cameras were an effective deterrent to speeding. However, in the follow-up focus groups there was a widespread lack of confidence in their use in practice. This was based on the view that fixed-site cameras were often not operating and there were insufficient mobile cameras.

It has been shown (Winnett, 1995) that speed cameras have reduced speeds and accidents but Corbett (1997a) suggests that their effect will be different for different sub-groups of drivers:

- Conformers – Drivers who always or nearly always comply with speed limits
- Deterred – Drivers who have reduced their speed since the cameras were installed
- Manipulators – Drivers who slow down to pass the camera box and then accelerate away from it
- Defiers – Drivers who have not reduced their excess speed since the arrival of cameras

The manipulators and defiers are of most interest to road safety planners. A consistent profile has emerged that manipulators tend to be among the fastest drivers and highest traffic offenders. They tend to believe in higher trigger speeds for cameras and they are less likely to think that camera boxes contain working cameras. They are less likely to think that they will be caught speeding on camera-targeted roads and they are less in favour of cameras. Importantly, it was noted that a fair proportion of those who slowed on the camera-targeted roads also slowed down on other local and main roads.

A cautionary note on deterrence comes from Kuwait (Ali et al, 1997) where speed cameras were installed but they had no effect on the 'undisciplined driving environment of the oil rich nations in the Middle East'. The findings demonstrated that in a traffic environment characterised by poor driving behaviour, inconsistent and piecemeal driver education programs, and insufficient presence of law enforcement officials, reliance on automatic cameras alone to reduce traffic violations is not likely to be effective.

4.5 Use of speed limiting devices

Simulator experiments by Carsten (1999) have shown that if drivers place too much reliance on technology for speed setting they may fail to choose a safe speed when conditions should dictate a slower speed than the limit set by the technology (e.g. speeds in fog were found to be higher for drivers using a system which advised them of the speed limit). Silcock et al (1999) found that speed limiters were viewed as having the potential to prevent speeding but that other measures were seen as more effective.

4.6 Summary

The research suggests that penalties, or the fear of penalties, can reduce speeding but penalties need to be perceived as fair. Speed cameras can act as an effective deterrent to speeding, though there is widespread belief that many fixed camera sites are not operating. Some drivers will continue to believe that their personal speed choice is safe and will slow down only when passing the camera site and accelerate to their preferred speed after it. Embarrassment at being stopped for speeding may act as a deterrent, though high speeders do not appear to be deterred by current levels of penalty.

5 Where does speeding occur?

The speeds of various categories of vehicles in the UK have been reported (DETR, 1999). The results are reproduced in Appendix B for urban, rural and motorway roads.

The results show that at least half of the drivers of all categories of vehicles (except buses, coaches, articulated HGVs and HGVs with more than 5 axles) exceed the speed limit on 30 miles/h roads. The highest average speeds and percentage of drivers exceeding 35 miles/h relate to motorcycles, cars and light goods vehicles, all with mean speeds of 32 miles/h and with 40%, 33% and 31% exceeding 35 miles/h respectively. The results for 40 miles/h roads differ from those for 30 miles/h roads, with the highest percentage of speeders in the motorcycle category, at 35%, with cars and light goods vehicles at 26% and 22% respectively. The percentage of motorcycles exceeding 45 miles/h is 19%, with cars and light goods vehicles at 8% and 6% respectively. On these roads also, buses and coaches are the most compliant of all categories.

Motorcycles are not included in the national statistics for rural roads and motorways reproduced in Appendix B.

The average speeds of light vehicles on rural roads and motorways follow a similar pattern to those on 40 miles/h urban roads, with average speeds generally slightly below the speed limit. A high percentage of cars travel faster than the posted speed limit on all road types other than rural single carriageways (where only 10% of car drivers are speeders). On motorways and dual carriageways about 55% of car drivers are speeders.

However, the percentages of speeders in the various categories are related to the actual speed limit of the category of vehicle. At least 60% of the HGVs subject to 40 or 50 miles/h limits exceed their speed limit on rural single and dual carriageway roads. About 6% of lorries exceed their limit by more than 10 miles/h (i.e. they are travelling at more than 60 miles/h) on dual carriageways, and about 14% of cars also travel more than 10 miles/h above their limit (i.e. they are travelling at more than 80 miles/h).

When the vehicle speed limit is lower than the national limit, as is the case for lorries, buses and towing vehicles on rural roads, it is the responsibility of the driver to be aware of the appropriate speed limit. If the driver uses the posted speed limit as his guide then this could be a factor in the level of speeding for these groups. However, it should be noted that in 1992 all new goods vehicles over 7.5 tonnes had to have speed limiters set at 60 miles/h and coaches had to have 70 miles/h limiters by 1992 (old coaches built before 1974 were exempt). The speed limiter settings were lowered in 1994 to 65 miles/h for new buses and coaches and to 56 miles/h for HGVs.

The confusion noted by Silcock et al (1999) relating to existing national limits (except for the 30 miles/h limit in town centres and the 70 miles/h limit on motorways) may be a factor in the amount of speeding on rural roads where a 50 or 60 miles/h limit applies, and on urban roads with a 40 miles/h limit. Drivers have difficulty in ‘reading’ the speed limit from the road design. Traffic calmed areas with 20 miles/h limits tend to use physical measures (narrowings, humps) which help drivers to recognise the limit (as well as making it uncomfortable to travel at higher speeds).

Graham (1997) found that 58% of respondents to a questionnaire in a road safety publication thought that highway road designs are conducive to speeds higher than the posted speeds.

Kaptein et al (1998) discussed the concept of the ‘Self Explaining Road’ in which drivers would know how to behave simply on the basis of road design. Their results showed that both narrowing the road and adding red bicycle lanes have an effect on driving speed choice, though road surface colour, reflector posts and centre line markings do not. Mayhew (1999) has also described the use of vehicle-activated signs to influence driver behaviour as acting to improve the self explaining nature of the road.

6 Discussion and conclusions

This report has examined a wide range of research on the characteristics of speeders and the effects of speed on accidents. It is clear that a considerable amount of knowledge exists. Most of the detailed research has been carried out on car drivers, and most speeding is done by car drivers. However, analysis of the vehicles which exceed the limit on different types of UK road suggests that there is also a problem with other vehicle types. Care should be taken when extrapolating the findings for car drivers to the drivers of other vehicles. It would be interesting to find out if people who drive/ride more than one type of vehicle behave in the same way in each. For example: do fast drivers travel faster than others whether they are on a motorcycle or in a lorry, or is their behaviour modified by the vehicle?

The percentages of speeders in the various categories are related to the actual speed limit of the category of vehicle. At least 50% of the HGVs subject to 40 or 50 miles/h limits exceed their speed limit on rural single and dual carriageway roads. About 6% of lorries exceed their limit by more than 10 miles/h (i.e. they are travelling at more than 60 miles/h) on dual carriageways and about 14% of cars also travel more than 10 miles/h above their limit (i.e. they are travelling at more than 80 miles/h).

Information about speeding by motorcyclists is limited to urban roads, but on 40 miles/h urban roads a high percentage of motorcyclists exceed 45 miles/h, though the actual numbers involved are considerably lower than of car drivers. An interesting issue raised by Silcock et al (1999) is that speeding behaviour requires continuous monitoring by the driver. In contrast to a decision not to drink and drive, which requires a decision before entering the vehicle and no further action within the vehicle, the decision not to speed needs constant vigilance once in the vehicle and it may be difficult to maintain in the light of events taking place in the road environment.

It was found that drivers' absolute speed is mainly dependent on the site characteristics and therefore it is important that the road layout gives the driver the right messages.

This review shows that:

- Many different people are speeders and a majority of drivers admit to speeding at some times.
- Faster drivers tend to be in the younger age bracket, to be male and to be travelling alone; about 40 years old is the transition when drivers become 'less likely' to speed. Younger drivers' speeding behaviour is the most likely to vary by time of day.
- Company car drivers, drivers in large cars (i.e. those with engine sizes of 2000cc or more) and drivers covering high annual mileages are more likely to drive faster than other drivers.
- Passengers affect speed, with most drivers choosing slower speeds when carrying passengers, but higher speeds being associated with young drivers carrying young male passengers.
- Speed choice (relative to the mean for the situation) tends to be consistent across all situations.
- Higher fines and penalties decrease the likelihood of drivers speeding, though it is likely that slight increases would not be sufficient to have an effect.
- The 'violation scale' and 'mild social deviance' are predictors of speed behaviour.
- Driving style and violation scores are both correlated with relative speed (i.e. speed relative to the mean speed at that location) such that careful, placid drivers are relatively slower and violators tend to be faster.
- Drivers' reaction times in a hazard perception test are not correlated with speed choice but hazard perception training has been shown to result in drivers choosing to drive more slowly.
- Drivers' physical condition (eyesight, reaction times) is associated with slower speeds but only insofar as these elements are associated with increased age.
- Drivers justify their personal speeding choices by assuming that they are 'ordinary, safe speeding drivers' while others are 'dangerous speeding drivers'.
- Drivers may justify speeding by assuming that speed limits are unrealistic.
- Drivers who showed 'akratic' behaviour (uncharacteristic behaviour) could not be distinguished from those who did not show 'akratic' behaviour using the categories associated with differences in speed choice, such as age etc as above.
- The attitudes of a group of fast drivers including some magistrates and police officers were indistinguishable from 'ordinary' drivers, both groups preferring to decide for themselves what was a safe speed.
- There is strong evidence that speed in excess of the speed limit and speed greater than the average for the situation are associated with increased accidents. Many of the characteristics of speeders also correlate with accidents.

7 Recommendations

The research reviewed in this report gives a useful description of the speeding driver. The questions which remain are less about the characteristics of these drivers than about how to change their behaviour in terms of their speed choices. Achieving substantial changes in speeding behaviour will require positive efforts to target problem drivers. Engineering measures, training and publicity will all have a role to play in addressing this. There will be a need to take account of the research evidence in all respects.

Unfortunately speeding is not currently viewed as an anti-social activity. Many drivers do not perceive speeding as having negative consequences or being a serious offence. While increased penalties could form part of a move to change perceptions, Corbett (1997a) suggested that the penalty levels would have to be very high to change the behaviour of the highest speeders. West (1997) suggests that appeals to self-interest may be more effective than suggestions that speeding is anti-social. Publicity and training emphasising the negative consequences for individuals may have more effect here. In general, it is likely that publicity programmes to change attitudes to speeding will need to develop a message which, as with alcohol publicity, contains the following sequential elements:

- acceptance of the general risk of speeding;
- recognition that risk is associated with one's own speeding;
- understanding the direct consequences of penalties (cost, effect on travel to work, effect on ones image etc);
- understanding the potential indirect consequences of ones own speeding on family and friends;
- recognition that one can do something about ones own speeding.

There is strong evidence that young drivers (in particular young, male drivers) are most prone to speeding.

If pre-test training included more information about the problems of speeding and included the consequences of excessive speed it is possible that a new generation of young drivers might be less likely to speed. However, it is likely that these young people are more influenced by their peer groups than the authority figure of the driving instructor. Publicity using figures who are admired by this group would probably be more effective than the use of such traditional authority figures.

Hazard perception training does appear to reduce speeds, even though drivers' hazard perception reaction times were not correlated with speed choices. Use of such training could, therefore, have the effect of making drivers aware of the potential for accident situations to build up. It may also reduce their perception that they are fully in control of the situation. Parker et al (1995) have suggested that drivers with high violation scores may fail to appreciate the potential danger of a vehicle edging out of a turning. Hazard perception training could increase the awareness of these drivers, causing them to reduce their speed.

Speeding by drivers of vehicles with lower limits than the posted limit on the road may be due to a number of factors. Time pressures on the drivers of delivery vehicles are recognised as a problem in speed setting for these drivers. It is important to ensure that attainable timetables are set for delivery vehicles. Another factor may be lack of knowledge of the specific limits and better training could help there.

While education, training and publicity all have the potential to act on the speeding driver it is difficult to attribute changes directly to these factors. Engineering solutions are often viewed as having a more direct effect.

New technology (radar/electronic speed limiters) can physically prevent speeding by making the vehicle slow to the speed limit. Internal speed regulators are increasingly being introduced for heavy vehicles (buses and lorries). However, simulator experiments by Carsten (1999) have shown that if drivers place too much reliance on technology for speed setting they may fail to choose a safe speed when conditions should dictate a slower speed than the limit set by the technology (e.g. speeds in fog were found to be higher for drivers using a system which advised them of the speed limit). Silcock et al (1999) found that speed limiters were viewed as having the potential to prevent speeding but that other measures were seen as more effective. The use of road-side beacons to either inform the driver of a safe speed or physically impose a maximum speed at particular sites (e.g. bends) is another option which is now technically feasible.

Changing the design of the road may help drivers to recognise the appropriate speed for a given road. Traffic calming uses physical measures to reduce speed (road humps, chicanes) but often also includes road narrowings to allow for wider footpaths or bicycle lanes. Silcock et al (1999) reported examples of how people adjusted their speeds to the ambience of the road. This could result in speeding if the road 'felt' suitable for higher speeds (e.g. on urban ring roads) or reductions in speed (e.g. where bus lanes or width restrictions are introduced). The research by Kaptein et al (1998) on Self Explaining Roads suggests that road narrowing can have an effect on speed choice and implies that there is potential for roads to be designed to inform the driver of the appropriate speed. Where infrastructural changes are inappropriate it may be possible to use vehicle activated signs to remind drivers of the posted speed limit, or an advisory limit for a hazard such as a bend or junction.

8 Acknowledgements

The work described in this report forms part of the programme of research undertaken by TRL for the Road Safety Division of the Department of the Environment, Transport and the Regions. The authors are grateful to Mr A Waddams and Ms H Ward, and to Mrs M Taylor (TRL) for their guidance.

9 References

Ali S, Al-She O and Koushki P (1997). *Effectiveness of automated speed - monitoring cameras in Kuwait*. Transportation Research Record no. 1595 p20-26.

Broughton J (1996). *The British index for comparing the accident record of car models*. Accident Analysis and Prevention Vol 28, No.1 pp 101-109, 1996.

Broughton J and Markey K (1996). *In-car equipment to help drivers avoid accidents.* TRL Report TRL198. Transport Research Laboratory, Crowthorne.

Carsten O (1999). *Proceedings of PACTS Conference – Speed: Whose Business is it?* London, Feb 1999.

Chapman P and Underwood G (1997). *Reporting and forgetting accidents and other driving events.* Behavioural research in road safety V11. Published Article PA3296/97. Transport Research Laboratory, Crowthorne.

Corbett C (1997a). *Unlawful driving behaviour from a criminological perspective.* Behavioural research in road safety V11. Published Article PA3296/97. Transport Research Laboratory, Crowthorne.

Corbett C (1997b). *Going against our better judgement: Akrasia and those unexplained decisions to drive faster*. Behavioural research in road safety V11. Published Article PA3296/97. Transport Research Laboratory, Crowthorne.

Corbett C, Simon F and O'Connell M (1998). *The deterrence of high speed driving: a criminological perspective*. TRL Report TRL296. Transport Research Laboratory, Crowthorne.

DETR (1999). *Transport Statistics Report. Vehicle Speeds in Great Britain:1998.* Department of the Environment, Transport and the Regions, London.

Finch D J, Kompfner P, Lockwood C R and Maycock G (1994). *Speed, speed limits and accidents*. Project Report PR58. Transport Research Laboratory, Crowthorne.

Graham S (1997). *Why do people speed? Questions remain but education, enforcement and engineering can slow drivers*. Traffic Safety, November/December 1997.

Holland C and Conner M (1996). *Exceeding the speed limit: an evaluation of the effectiveness of a police intervention.* Accident Analysis and Prevention, Volume 28, Number 5, September 1996.

Horne J and Reyner L (1997). *Driver sleepiness.* Behavioural research in road safety V11. Published Article PA3296/97. Transport Research Laboratory, Crowthorne.

Horswill M and McKenna F (1997). *Measuring, manipulating and understanding drivers' speed choice*. Behavioural research in road safety V11. Published Article PA3296/97. Transport Research Laboratory, Crowthorne.

Kaptein N A, van Hattum S T and van der Horst A R A (1998). *Categorisation of road environments and driving speeds*. MASTER Deliverable 9. EU Commission, Brussels.

Levelt P (1998). *Speed and motivation: established and newly developed ideas about the content of questionnaires and the designing of campaigns*. MASTER contract No RO-96-SC.202. EU Commission, Brussels.

Lipscombe A and Wilkinson D (1996). *The speeding driver*. Management and road safety. PTRC 24th European Transport Forum, September 1996.

Lynn P and Lockwood C R (1998). *The accident liability of company car drivers*. TRL Report TRL317. Transport Research Laboratory, Crowthorne.

Maycock G, Lockwood C R and Lester J F (1991). *The accident liability of car drivers*. Research Report RR315. Transport Research Laboratory, Crowthorne.

Maycock G, Brocklebank P and Hall R (1998). *Road layout design standards and driver behaviour*. TRL Report TRL332. Transport Research Laboratory, Crowthorne.

Mayhew N (1999). *New directions in road safety*. Proceedings of PACTS Conference – Speed: Whose Business is it? London, Feb 1999.

McDonald M, Ingham R and Rolls S (1992). *Safe and unsafe – a comparative study of young male drivers*. AA Foundation for Road Safety Research, Basingstoke.

McKenna F P, Waylen A E, and Burkes M E (1998). *Male and female drivers: how different are they?* AA Foundation for Road Safety Research, Basingstoke.

Parker D, West R, Stradling S and Manstead A (1995). *Behavioural characteristics and involvement in different types of traffic accident*. Accident Analysis and Prevention, Volume 27, Number 4, August 1995.

Parker D, Manstead A, Stradling S and Senior V (1998). T*he development of remedial strategies for driving violations*. TRL Report TRL300. Transport Research Laboratory, Crowthorne.

Quimby A, Maycock G, Palmer C and Butress S (1999a). *The factors that influence a driver's choice of speed – a questionnaire study*. TRL Report TRL325. Transport Research Laboratory, Crowthorne.

Quimby A, Maycock G, Palmer C and Grayson G (1999b). *Drivers speed choice: an in-depth study*. TRL Report TRL326. Transport Research Laboratory, Crowthorne.

Reason J T, Manstead A S R, Stradling S G, Parker D and Baxter J S (1991). *The social and cognitive determinants of aberrant driving behaviour.* Contractor Report CR253. Transport Research Laboratory, Crowthorne.

Rienstra S A and Rietveld P (1996). *Speed behaviour of car drivers: a statistical analysis of acceptance of changes in speed policies in the Netherlands*. Transport Research-D Vol 1, No 2 pp 97-110.

SARTRE (1998). *The attitude and behaviour of European car drivers to road safety*. SARTRE 2 reports. Part1, report on principal results. EU Commission, Brussels.

Scottish Office Central Research Office (1994). *Attitudes of Scottish drivers towards speeding – 1994 Survey*. Scottish Office, Edinburgh.

Silcock D, Smith K, Knox D and Beuret K (1999). *What limits speed? Factors that affect how fast we drive*. AA Foundation for Road Safety Research, Basingstoke.

Stark D (1995). *Speeding is an important urban problem*. The 23rd European Transport Forum. Warwick, September 1995.

Stradling S (1997). *Violations as 'Crash magnets'*. Behavioural research in road safety V11. Published Article PA3296/97. Transport Research Laboratory, Crowthorne.

Stradling S (1999). *Why drivers speed*. Proceedings of PACTS Conference – Speed: Whose Business is it? London, Feb 1999.

Taylor M, Lynam D and Baruya A (2000). *The effects of drivers' speed on the frequency of road accidents*. TRL Report TRL421. Transport Research Laboratory, Crowthorne.

Webster D C and Mackie A M (1996). *Review of traffic calming schemes in 20 mph zones*. TRL Report TRL215. Transport Research Laboratory, Crowthorne.

West R (1997). *Cross-cultural generalisability of relationship between anti-social motivation and traffic accident risk*. TRL Report TRL294. Transport Research Laboratory, Crowthorne

Winnett M A (1995). *Management of speed through camera enforcement*. TRAFFEX 1995.

Appendix A: Items used in the psychological scales (Quimby et al, 1999a)

Hazard involvement scale

When driving how often do each of the following things happen? (6 point scale)

You have to brake sharply to avoid a collision with the vehicle ahead of you.

You misjudge the speed of an oncoming vehicle when overtaking.

You pull out to overtake or turn right not noticing another vehicle in your 'blind spot'.

You fail to notice someone waiting at a pedestrian crossing.

You misjudge the gaps in main road traffic when pulling out of a side road.

When cornering you find you are travelling too fast to negotiate the bend safely and have to brake.

You fail to give way when entering a roundabout to a vehicle already on the roundabout.

You have to brake or swerve suddenly to avoid an accident.

Violation scale

When driving how often do you do each of the following? (6 point scale)

Knowingly exceed the 30 miles/h speed limit in built up areas.

Get involved in unofficial 'races' with other drivers.

Become impatient with a slow driver and overtake on the inside.

Disregard speed limits late at night.

Drive through a traffic light after it has turned red.

Try to beat other drivers when getting away from traffic lights.

Knowingly exceed the speed limit on motorways.

Drive after drinking alcohol even though you think you may be over the limit.

Decision making style

How do you make decisions? (6 point scale)

Do you work out the pros and cons before making a decision?

When deciding between two options do you tend to favour one and then change your mind and pick the other?

Do you enjoy making decisions?

Do you remain calm when you have to make decisions quickly?

Is your decision making a deliberate logical process?

Do you rely on 'gut feeling' when making a decision?

Do you prefer to avoid making decisions?

Driving style

Attentive, Careful, Safe, Placid, Patient, Tolerant

Appendix B: Vehicle speeds on UK roads

Figures from Transport Statistics Report. Vehicle Speeds in Great Britain:1998. (DETR, 1999)

Urban roads 30 miles/h limit

	Average speed miles/h	*Percent over 30 miles/h*	*Percent over 35 miles/h*	*Number observed*
Motorcycles	32	63	40	8000
Cars	32	69	33	1980000
Cars towing	30	59	21	7000
Light goods	32	67	31	124000
Buses/coaches	28	41	13	18000
Rigid 2 axle	31	57	21	59000
Rigid 3 axle	30	54	17	4000
Articulated	29	47	14	2000
Rig/art 4 axle	30	55	19	9000
Rig/art 5+ axle	29	46	13	8000

Urban roads 40 miles/h limit

	Average speed miles/h	*Percent over 40 miles/h*	*Percent over 45 miles/h*	*Number observed*
Motorcycles	36	35	19	5000
Cars	36	26	8	803000
Cars towing	35	18	3	3000
Light goods	35	22	6	61000
Buses/coaches	31	7	1	6000
Rigid 2 axle	34	16	5	30000
Rigid 3 axle	34	13	2	3000
Articulated	32	7	1	1000
Rig/art 4 axle	33	10	2	5000
Rig/art 5+ axle	33	9	1	5000

Rural single carriageway roads

	Speed limit miles/h	*Average speed miles/h*	*Percent over limit*	*Percent 10 miles/h over limit*	*Number observed*
Motorcycles		Not included			
Cars	60	46	10	2	7776000
Cars towing	50	44	23	2	78000
Light goods	60	46	8	1	609000
Buses/coaches	50	42	19	2	47000
Rigid 2 axle	n/a	44	n/a	n/a	427000
Rigid 3-4 axle	40	42	60	17	85000
Articulated	40	45	72	26	344000
Rig/art 4 axle	40	43	63	20	148000
Rig/art 5+ axle	40	46	76	30	237000

Rural dual carriageway roads

	Speed limit miles/h	*Average speed miles/h*	*Percent over limit*	*Percent 10 miles/h over limit*	*Number observed*
Motorcycles		Not included			
Cars	70	70	54	14	6381000
Cars towing	60	57	36	7	48000
Light goods	70	66	38	7	490000
Buses/coaches	60	59	49	3	30000
Rigid 2 axle	n/a	58	n/a	n/a	356000
Rigid 3-4 axle	50	53	79	5	65000
Articulated	50	55	91	6	497000
Rig/art 4 axle	50	54	86	7	164000
Rig/art 5+ axle	50	55	93	7	379000

Motorways

	Speed limit miles/h	*Average speed miles/h*	*Percent over limit*	*Percent 10 miles/h over limit*	*Number observed*
Motorcycles		Not included			
Cars	70	69	55	19	52972000
Cars towing	60	57	31	5	372000
Light goods	70	66	40	9	4229000
Buses/coaches	70	60	3	0	303000
Rigid 2 axle	n/a	59	n/a	n/a	3272000
Rigid 3-4 axle	60	54	11	1	531000
Articulated	60	55	7	0	5170000
Rig/art 4 axle	60	54	6	0	1696000
Rig/art 5+ axle	60	55	8	0	3869000

Abstract

A wide range of research covering the demographics and psychological characteristics of the speeding driver has been reviewed. Research on personal characteristics and behaviour which are linked to accidents has also been included. The specific deterrence effects of penalties, police intervention and speed cameras were considered and research on the types of vehicles and the types of road where speeding is prevalent was examined. Some possibilities concerning education, training and publicity policies which might influence speed reduction, and engineering measures which might reduce speeding, are briefly discussed.

Related publications

TRL421 *The effects of drivers' speed on the frequency of road accidents* by M C Taylor, D A Lynam and A Baruya. 2000 (price £35, code H)

TRL332 *Road layout design standards and driver behaviour* by G Maycock, P J Brocklebank and R D Hall. 1998 (price £35, code H)

TRL326 *Drivers' speed choice: an in-depth study* by A Quimby, G Maycokck, C Palmer and G B Grayson. 1999. (price £25, code E)

TRL325 *The factors that influence a driver's choice of speed – a questionnaire study* by A Quimby, G Maycock, C Palmer and S Buttress. 1999. (price £35, code H)

TRL317 *The accident liability of company car drivers* by P Lynn and C R Lockwood. 1999. (price £25, code E)

TRL300 *The development of remedial strategies for driving violations* by D Parker, A Manstead, S Stradling and V Senior. 1999. (price £25, code E)

TRL296 *The deterrence of high speed driving: a criminological perspective* by C Corbett, F Simon and M O'Connell. 1998 (price £35, code J)

TRL294 *Cross-cultural generalisability of relationship between anti-social motivation and traffic accident risk* by R West. 1998 (price £20, code A)

TRL215 *Review of traffic calming schemes in 20 mph zones* by D C Webster and A M Mackie. 1996 (price £35, code H)

TRL198 *In-car equipment to help drivers avoid accidents* by J Broughton and K A Markey. 1996 (price £35, code H)

Prices current at March 2000

For further details of these and all other TRL publications, telephone Publication Sales on 01344 770783 or 770784, or visit TRL on the Internet at http://www.trl.co.uk.