HIGHWAY CODE AND AGGRESSIVE VIOLATIONS IN UK DRIVERS

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The 3 Aspects of Driving

Driving is a skill-based, rule-governed, expressive activity and there are three aspects involved in being socialised into becoming a member of the driving community:

1. In the **technical mastery** phase the beginning driver learns how to control, position and manoeuvre the vehicle and make smooth progress - starting; stopping; steering; clutch control, changing gear; reversing, mirror-signal-manoeuvre. Until a good level of mastery is achieved, the driver will be unsafe.
2. In the **reading the road** phase the driver must learn which cues to use to anticipate the actions of other road users, especially the unsignalled or unexpected actions of others when they depart from the formal rules or from common local practices, and how to handle ill-defined situations and unusual road conditions.
3. In the **expressive phase** the driver uses the manner in which they drive to give expression to personality, attitudinal and motivational characteristics. How you drive is related to, but distinguishable from, what you drive (that the kind of car you drive is a ‘wannabe’ factor has long been understood by manufacturers and advertisers). Style of driving typically varies with age, gender and experience, but some basic ‘scripts’ for driving (e.g. "I am a very skilful driver and can handle the beast at speed", "Other drivers should look out for me rather than me look out for them", "Other drivers are just ordinary people trying, like me, to cope with a difficult and frustrating task and they deserve my respect and consideration") may persist throughout a driving career. When manner of driving is informed by ‘bad attitude’ the driver is dangerous.

Lapses, Errors & Violations

Studies by the Manchester Driver Behaviour Research Group over the past decade have concentrated on this third phase - the manner in which the car is driven - seeing this as an expression of the psychological characteristics of the driver.

On the basis of a number of large scale, national surveys in England asking drivers how often they experience certain driving manoeuvres (Reason *et al*, 1990; Meadows, 1994; Parker *et al*, 1995a, b; Lawton et al, 1997a, b), we have been able to identify three basic types of driving behaviours:

- Lapses, Errors and Violations.

This basic tripartite typology has been replicated in studies of drivers in Australia (Blockley & Hartley, 1995), Sweden (Aberg & Rimmo, 1998), New Zealand (Sulmann & Meadows, 2000), China (Xie et al, 2000) and Greece (Kontogiannis et al, in submission). The survey questions we use on the Manchester Driver Behaviour Questionnaire (DBQ) to measure how often drivers experience each of these three types of driving behaviours are as follows.

Table 1 DBQ Lapse Items

Lapses. How often* do you:

- Try to pull away from the traffic lights in third gear?
- Switch on one thing when you meant to switch on another?
- Take the wrong lane approaching a roundabout or junction?
- Misread the signs and exit from a roundabout on the wrong road?
- Realise you have no clear recollection of the road along which you have just been travelling?
- Intending to drive to destination A, you 'wake up' to find yourself on the road to destination B, perhaps because the latter is your more usual destination?
- Forget where you left your car in the car park?
- Hit something when reversing that you had not previously seen?

*rated on a 6-point scale from 'Never' to 'Nearly all the time'.

Lapses (Table 1) are potentially embarrassing and may be a source of inconvenience to the driver, but are not usually life-threatening. They are more commonly reported by female than by male drivers. Age is also statistically associated with Lapses, with older drivers tending to report more. This may be associated with increasing problems amongst the elderly population of dividing attention, especially the monitoring of the current state of highly automated cognitive processes (Aberg & Rimmo, 1998).

Table 2 DBQ Error Items

Errors. How often* do you:

- Fail to see a 'Stop' or 'Give Way' sign and narrowly avoid colliding with traffic having right of way?
- On turning nearside, fail to see a cyclist who has come up on your inside?
- Fail to notice that pedestrians are crossing when turning into a side street from a main road?
- Fail to check your rear-view mirror before pulling out or changing lanes?
- Queuing to turn nearside onto a main road, you pay such close attention to the mainstream of traffic that you nearly hit the vehicle in front?
- Brake too quickly on a slippery road, or steer the wrong way in a skid?
- Underestimate the speed of an oncoming vehicle when overtaking?
- Attempt to overtake someone you hadn't noticed to be signalling an offside turn?

*rated on a 6-point scale from 'Never' to 'Nearly all the time'.

Errors (Table 2) are an example of the failure of planned actions to achieve their intended consequence (Reason et al, 1990) and include both failures of observation and misjudgements. Errors, like Lapses, have a weak, but statistically significant association with length of pre-licence driving (Meadows, 1994) and, typically, no systematic relation to age or sex.

Table 3 DBQ Violation Items

Violations. How often* do you:

- Disregard the speed limits late at night or very early in the morning?
- Cross a junction knowing that the traffic lights have already turned against you?
- Drive especially close to the car in front as a signal to its driver to go faster or get out of the way?
- Get impatient with a slow driver and overtake on the inside?
- Get involved in unofficial 'races' with other drivers?
- Have an aversion to a particular class of road user, and indicate your hostility by whatever means you can?
- Angered by another driver's behaviour, you give chase with the intention of giving them 'a piece of your mind'?
- Drive even though you realise you may be over the legal blood-alcohol limit?

*rated on a 6-point scale from 'Never' to 'Nearly all the time'.

Violations (Table 3) – the kinds of behaviours which typically figure in lay accounts of aggressive driving - are here defined as deliberate deviations from those practices believed necessary to maintain the safe operation of a potentially hazardous system (Reason et al, 1990), or deviations from normative, reference performance on the road (Rothengatter, 1997), and are to be distinguished from the North American usage where a driver's traffic violations are simply a count of the number of times he or she has been apprehended for breaches of the road traffic regulations. While some of what we call Violations are directly in breach of, and others might, in their execution, involve breach of UK traffic regulation (Stradling et al, 1990), the focus here is on self-reports of generally recognised 'unsafe acts' rather than on transgression of a legal code.

Many road safety professionals cite "Speed and alcohol, especially in combination" as the most important immediate precursors of crashes. The Manchester analysis, dividing aberrant driving behaviours into three kinds, shows speeding to be the most frequent and drink-driving (these days, thankfully) to be the least frequent of a more general class of driving behaviours - Violations. Drivers who commit one type of Violation are more likely to commit other types.

Violations and Crash Involvement

Violations are consistently reported with higher frequency by male drivers, by younger drivers, and by high-mileage drivers. However, the crucial differentiator between Violations, Errors and Lapses is that Violations, not Errors or Lapses, go with crash-involvement. Typically in our studies it is those drivers who score high on Violations, not those who score high on Errors or Lapses, who are statistically more likely to have been accident-involved as drivers in the past (Parker et al, 1995b). and to be accident-involved (again) in the future (Parker et al, 1995c).

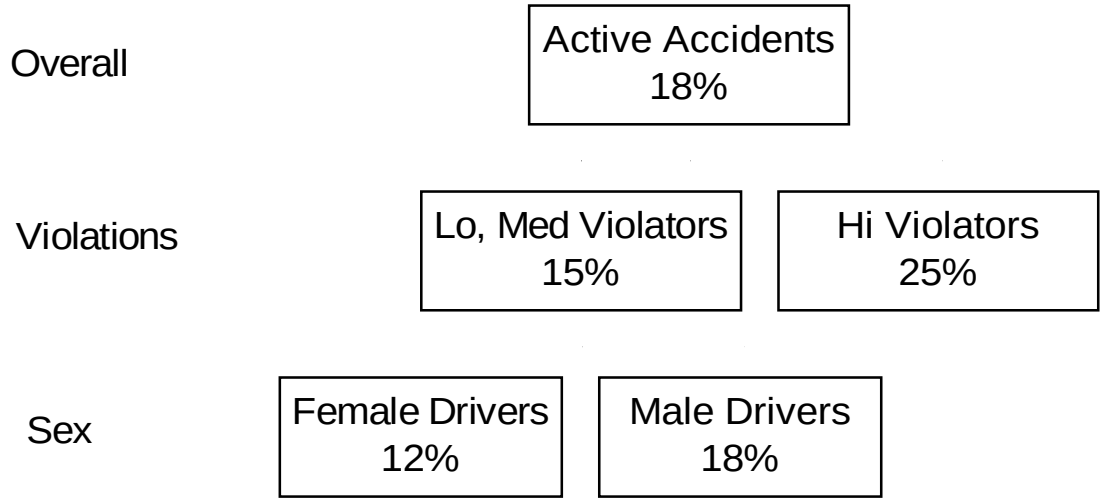
And this applies to both

- Active Accidents — I hit another vehicle or an obstacle or lost control of the vehicle and left the carriageway, and
- Passive Accidents — I was hit by another vehicle (West, 1995).

That is, high Violators are not only more likely to run into others or to run off the road, but to put themselves in situations where others run into them.

For example, reanalysing the data from one study (Meadows, 1994) using the SPSS CHAID package, we found that 12% of female low or medium Violators from a sample of 1000 drivers had one or more active crashes in the previous 3 years, compared to 18% of male low or medium Violators and 25% of high Violators (Figure 1).

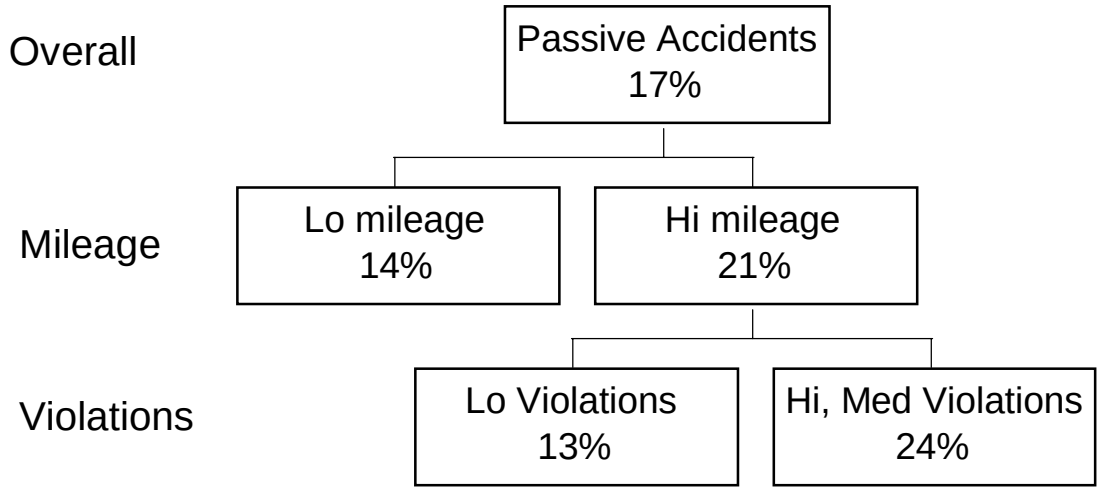
Figure 1 One Or More Active Accidents In Previous Three Years



When driving carefully, male drivers are more at risk than female drivers (18% vs. 12%: but UK males report a 50% higher average annual mileage). But female drivers who adopt a high violating manner of driving more than double (12% to 25%), and male drivers increase by almost a half (18% to 25%), their risk of active crash involvement.

For passive crashes in the previous 3 years the figures were 14% for low mileage drivers, 13% for high mileage drivers who were low Violators, but 24% for high mileage drivers who were medium or high Violators.

Figure 2 One Or More Passive Accidents In Previous Three Years:



High mileage drivers are more at risk of passive crashes - having others run into them - by virtue of their greater exposure (21% vs. 14%). But a low violating manner of driving is prophylactic, and low violating, high mileage drivers may protect themselves, reducing their risk to the same level as low mileage drivers (13%).

Thus bad attitudes make for bad drivers. And these findings call into question the conventional wisdom that road traffic accidents arise solely as a result of lack of skill on the part of drivers, and thus that the most effective way to reduce the number of accidents is to provide better training or remedial retraining in driver skills. Our findings are consistent with a general pattern of recent research findings from a number of countries (Waller, 1997) suggesting that:

- while some skill is essential in order to survive on the road, greater car handling skill does not necessarily result in safer driving, as some skilful drivers choose to drive in a risky manner.

Identifying a class of drivers who are more at risk on the roads - a greater risk both to themselves and to others - increases the scope for remedial action by targeting a particular segment of the driving population whose characteristics may be reasonably well specified. What do we know of the psychological characteristics of high-Violators?

When we divide drivers into three equal sized groups of High, Medium and Low Violators we find that:

- around 40% of Male drivers are High Violators as opposed to 20% of Female drivers
- over 50% of male drivers aged 17-25 and approaching 40% of female drivers aged 17-25 are High Violators.

Thus male drivers and young drivers are over-represented in the High Violator group: and we believe that this is a large part of the reason why young males in particular are over-represented in the traffic accident statistics.

However we should bear in mind that :

- not all High Violators are young and male (around 10% of female drivers aged 35 years and over fall in the High Violator group);
- not all young male drivers are High Violators (around 20% are Low Violators)

so that persuasive materials aimed solely at young male drivers will miss some targets and may antagonise others who should be role models, not targets.

Table 4 Characteristics Of High Violating Drivers

High Violators tend to:

- be young rather than old, be male rather than female, and be high mileage rather than low mileage drivers (Reason et al, 1990; Stradling et al, 1999)
- consider themselves (even) better drivers than do others (Reason et al, 1990)
- report stronger intentions to speed across different road types (residential road, shopping street, country lane, dual carriageway, 3-lane motorway) (Lawton et al, 1997c)
- over-estimate the number of other drivers who speed, drive too close, etc. (Manstead et al, 1992)
- rate the potential adverse consequences of their actions (e.g. having an accident, being stopped by the police) as less likely, and as less bad (Parker et al, 1992a,b)
- believe that their significant others are less likely to disapprove (Parker et al, 1992a)
- think that other drivers will be less upset by their bad behaviour (Stradling et al, 1992)
- are more likely to experience immediate, positive affect ('feel good') while violating, and
- are less likely to anticipate feeling regret after violating behaviour (Parker et al, 1995a)
- think refraining from the behaviours would be more difficult and thus that they are less in control of their behaviour (Parker et al, 1995a)
- show greater outward irritability (anger directed towards others) (Lawton et al, 1997a)

Highway Code and Aggressive Violations

Finally convinced that it was Violations that was the crucial variable, we developed some further Violation items. A study (Lawton et al, 1997a: Study 1) using an extended version of the Violations scale of the Manchester Driver Behaviour Questionnaire (DBQ) distinguished two classes of violations - highway code violations such as speeding and running red lights, and more directly interpersonally aggressive violations such as sounding one's horn or giving chase to another driver

when angered. Further studies (Lawton et al 1997a, Study 2; Parker et al, 1998) have confirmed this distinction between highway code and interpersonally hostile violations. A full set of the Highway Code Violation, Aggressive Violation and Error items of the current, modified DBQ are given in Table 5, arranged in descending order of frequency of reported commission within each set of items.

Table 5 Highway Code Violation (HCV), Aggressive Violation (AV) And Error (E) Items Of The Modified Driver Behaviour Questionnaire (DBQ)

Disregard the speed limit on a motorway	HCV
Disregard the speed limit on a residential road	HCV
Race away from the traffic lights with the intention of beating the driver next to you	HCV
Drive especially close to the car in front as a signal to its driver to go faster or get out of the way	HCV
Cross a junction knowing that the traffic lights have already turned against you	HCV
Stay in a lane that you know will be closed ahead until the last minute before forcing your way into another lane	HCV
Become impatient with a slow driver in an outer lane and overtake on the inside	HCV
Drive even though you suspect you may be over the legal blood-alcohol limit	HCV
Become angered by a certain type of driver and indicate your hostility by whatever means you can	AV
Sound your horn to indicate your annoyance to another driver	AV
Pull out of a junction so far that the driver with right of way has to stop and let you out	AV
Become angered by another driver and give chase with the intention of giving him/her a piece of your mind	AV
Underestimate the speed of an oncoming vehicle when overtaking	E
Queuing to turn left onto a main road, you pay such close attention to the mainstream of traffic that you nearly hit the car in front	E
Fail to check your rear-view mirror before pulling out, changing lanes, etc.	E
Fail to notice that pedestrians are crossing when turning into a side street from a main road	E
Brake too quickly on a slippery road, or steer the wrong way in a skid	E
Miss ‘Stop’ or ‘Give Way’ signs and narrowly avoid colliding with other traffic	E
On turning left nearly hit a cyclist who has come up on your inside	E
Attempt to overtake someone you hadn’t noticed signalling an offside turn	E

*rated on a 6-point scale from ‘Never’ to ‘Nearly all the time’.

Highway Code and Aggressive Violations and Anger on the Road

How does level of commission of these two aspects of what in lay terms would be called ‘aggressive’ or ‘unsafe’ driving relate to getting angry on the road?

Deffenbacher et al (1994) developed a Driving Anger Scale (DAS) to metricate the anger induced by a range of traffic situations. The scale was developed on an extensive sample of American college students. When we ran an anglicised version of the scale (Lajunen et al, 1998) we found three factors underlying the anger of a sample of UK drivers: anger when progress is impeded as a result of slow or discourteous driving by others (PI, Table 6), anger at the reckless driving of others (RD), and anger at being the target of direct hostility from other drivers (DH).

Table 6 DAS Factor Structure And Item Means* For UK Drivers

	PI	RD	DH
Someone cuts in and takes the parking spot you have been waiting for	3.1		
Someone speeds up as you try to pass them	2.6		
Someone is driving too slowly in the outside lane, and holding up traffic	2.5		
Someone pulls out right in front of you when there is no one behind you	2.5		
A slow vehicle on a winding road will not pull over and let people pass	2.3		
Someone is driving more slowly than is reasonable for the traffic flow	2.2		
A cyclist is riding in the middle of the lane, slowing traffic	2.1		
Someone in front of you does not move off straight away when the traffic lights turn green	1.7		
A pedestrian walks slowly across the middle of the street, slowing you down	1.7		
Someone is driving very close to your rear bumper		3.1	
Someone cuts in right in front of you on the motorway		2.9	
Someone backs out right in front of you without looking		2.7	
At night someone is driving right behind you with bright lights on		2.7	
Someone coming towards you does not dim their headlights at night		2.5	
Someone runs a red light or 'Stop' sign		2.4	
Someone is weaving in and out of the traffic		2.3	
Someone is driving too fast for the road conditions		2.3	
Someone is driving well above the speed limit		2.1	
Someone makes an obscene gesture towards you about your driving			2.5
Someone shouts at you about your driving			2.2
Someone beeps their horn at you about your driving			2.1

*Items on 1 – 5 scale from 1 'Not at all' to 5 'Very much'.
PI = Progress Impeded; RD = Reckless Driving by others; DH = Direct Hostility by others

Table 7 (extracted from Lajunen et al, 1998, Table 5) shows scores on all three factors correlating negatively with age, with younger drivers tending to show higher levels of all three types of anger on the roads. Mileage was related to only one factor, and then only weakly. And gender differences proved statistically insignificant: male and female drivers reporting on average similar levels of all three types of driver anger – anger at having their progress impeded; anger at the reckless driving of others, and anger on receiving direct hostility from others.

Table 7 Correlations Between DAS Factors And Driver Variables

	Progress Impeded	Reckless Driving	Direct Hostility
Age	-.33***	-.18**	-.27***
Sex	ns	ns	ns
Mileage	ns	-.14*	ns
Highway Code Violations	.45***	ns	.31***
Aggressive Violations	.51***	.32***	.40***

*** p < .001; ** p < .01; * p < .05; ns = not statistically significant

Table 7 also shows that drivers scoring high on Highway Code Violations are more likely to get angered when their progress is impeded – not surprising as most HCVs are intended to facilitate swifter progress to one's destination (though whether they actually do so, especially in urban traffic, is another matter). But those who own to expressing more interpersonally aggressive Violations while driving – act on their anger by showing hostility or giving chase, push out at junctions, display displeasure by sounding their horn - also report higher levels of all three kinds of anger on the road. Those who express their aggression on the roads report getting more angry when their progress is impeded, when others drive in a manner that compromises safety, when others comment on the standard of their driving by beeping, shouting or gesturing at them.

Characteristics of Highway Code and Aggressive Violators

Data from our most recent study (Stradling et al, 1999) using the modified DBQ confirmed the distinction between HCVs and AVs. SPSS Answer Tree was used to characterise high scorers on Highway Code and Aggressive Violations on a range of demographic and vehicle variables. These analyses are summarised in Table 8.

Table 8 Effects Of Demographic And Vehicle Characteristics On Level Of Commission Of Highway Code And Aggressive Violations

Factor	Highway Code Violations	Aggressive Violations
Age Band	17-24 > 25-40 > 41-59 > 60-68 > 69+	17-40 > 40-49 > 50-69 > 70+
Sex	M > F	M > F
SES	A/B > C1 > C2 > D/E, Retired	A/B, C1, C2 > D/E, Retired
Annual Household Income	£40K+ > £20-40K > £10-20K > below £10K	£30K+ > £10-30K > below £10K
Domicile	City, Town or Suburb higher	City, Town, Suburb higher
Experience	1-3 yrs > 4-23 > 24+	1-23 yrs > 24+
Engine Size	1.8L+ > 1.4-1.6L > below 1.4L	>1.4L, higher
Age of Car	1-7 yrs higher	no effect
Annual Mileage	20K+ > 8-20K > 3-8K > below 3K	>8K, higher
Company Car	Yes, higher	Yes, higher (p = .053)
Drive As Work	Any, higher	Any, higher

Profiles for perpetrators of the two types of Violations were very similar. High Violating car drivers of both kinds were more likely to be young, to have less driving experience and to be male. They were of higher social class and from higher income households. They were more likely to be domiciled in-town (in city, town or suburb) than out of town.

And those who report higher levels of Violation, of both kinds, tend to drive larger engined cars, to drive higher mileages, to drive company-owned cars, and to drive as part of their work.

These results give the individual effects for each of the variables considered separately. In addition, analyses of covariance (ANCOVA: Table 9) were conducted to assess the effects of age and gender, with drivers' reported annual mileage – the more you drive the more opportunity you have to violate – entered first as a covariate, to correct for differences between males and female, young and old, in the amount of driving (though, it should be noted, this analysis only corrects for

differences in amount - reported annual mileage - between these groups, they also differ in their trip agendas when driving – Stradling et al, 1999).

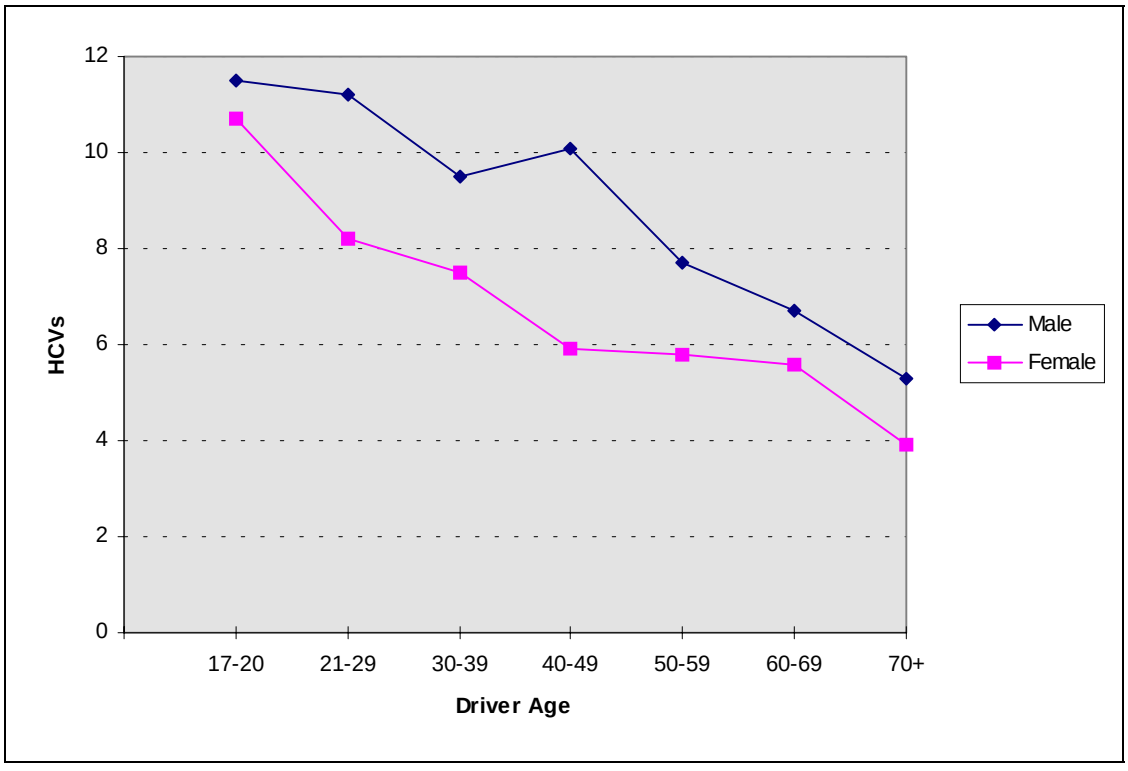
Table 9 ANCOVAs With Mileage Entered First As Covariate

	Mileage		Sex		Age	
	F	p	F	p	F	p
Highway Code Violations	42.83	***	22.65	***	13.47	***
Aggressive Violations	7.74	**	3.76	.053	13.21	***

*** p < .001; ** p < .01; * p < .05

Level of Highway Code Violation is strongly affected by mileage ($F = 42.83$; $p < .001$) with higher mileage drivers reporting higher levels of HCVs. Analysis of estimates corrected for mileage differences shows highly significant main effects for sex ($F = 22.65$; $p < .001$) and age ($F = 13.47$; $p < .001$) with male car drivers consistently reporting a higher mean level of HCVs than age-equivalent females, and both sexes showing decline with age. These estimates are plotted in Figure 3.

Figure 3 Highway Code Violations By Age Band And Sex, Correcting For Mileage

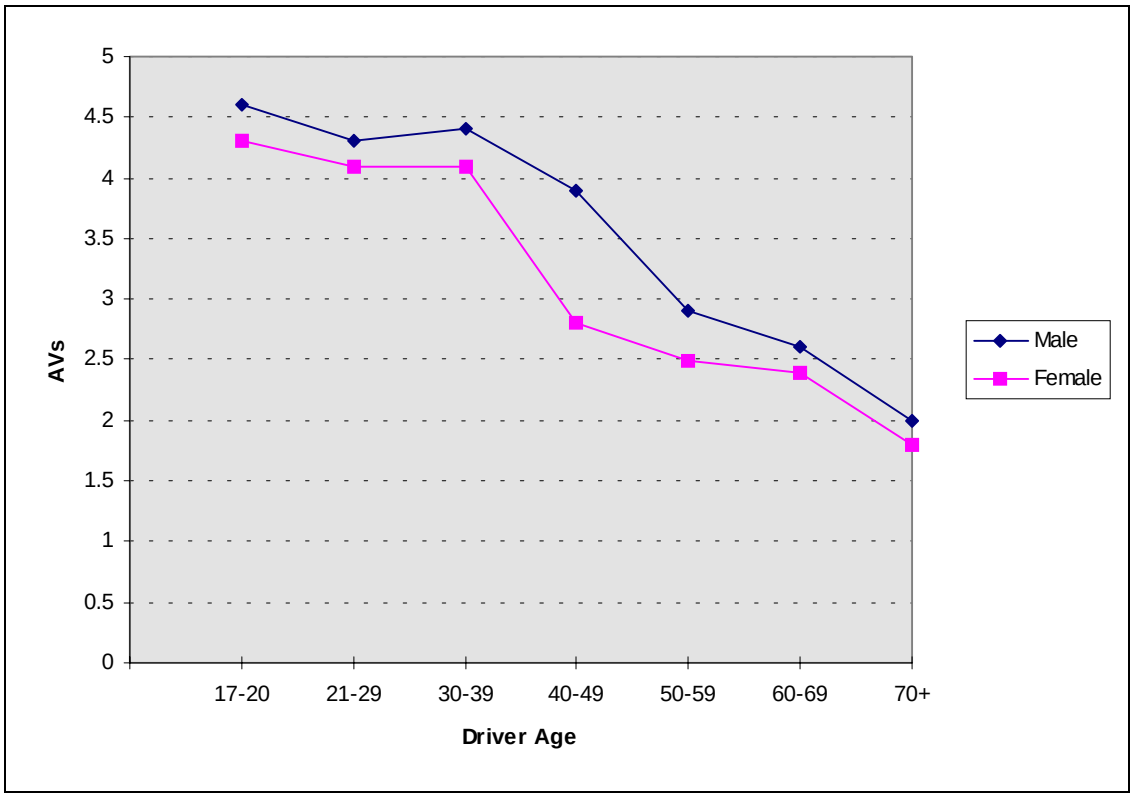


Level of Aggressive Violation is less strongly - though still significantly - affected by mileage ($F = 7.74$; $p < .01$) with higher mileage drivers tending to report higher levels of AVs. Analysis of estimates corrected for mileage differences shows a highly significant main effect for age ($F = 13.21$; $p < .001$) but the sex difference of Table 8 does not now reach statistical significance ($F = 3.76$; $p = .053$).

Examination of the plot of the corrected estimates for AVs (Figure 4) indicates that male and female car drivers show very similar trajectories across the age range. For each age-band the plotted values for males and females are similar, and the two

trajectories suggest that - when comparison is made of figures corrected for mileage - both sexes show relatively high scores for aggressive violations on the road from ages 17 to 40, before declining linearly across the remainder of the age range.

Figure 4 Aggressive Violations By Age Band And Sex, Correcting For Mileage

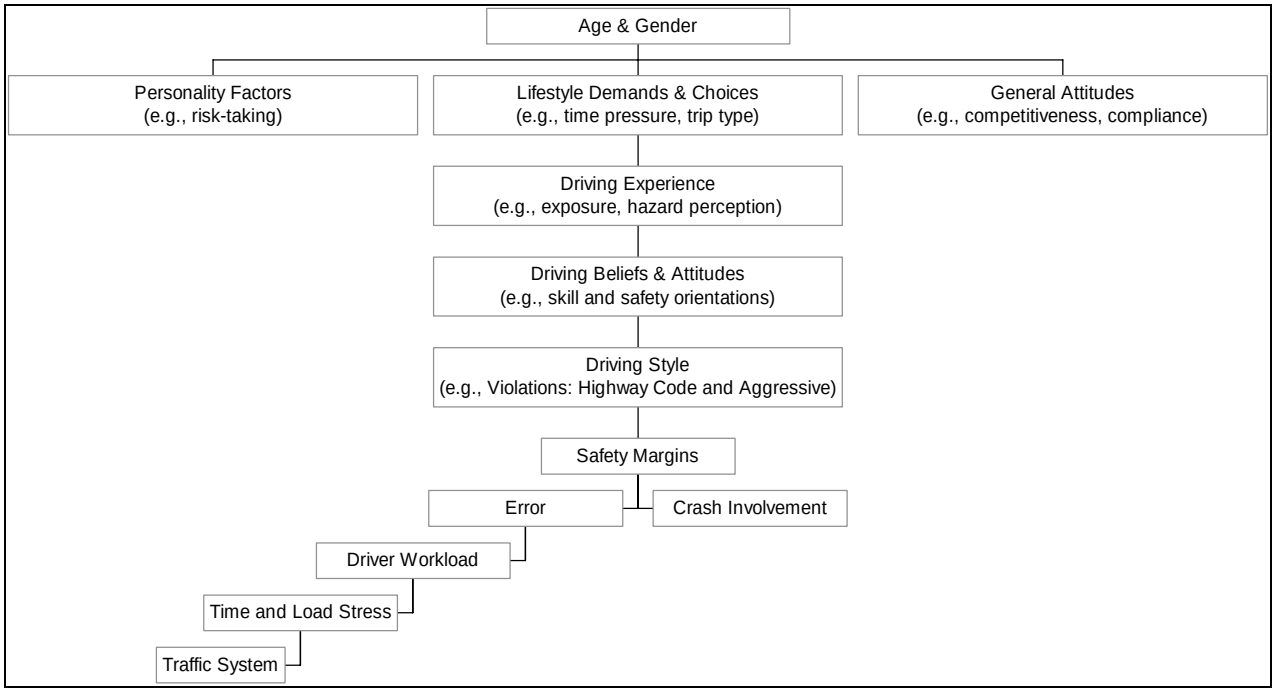


Summary and a Descriptive Model

Safe driving requires more than skilful vehicle handling. It requires technical intelligence to handle the car, environmental intelligence to read the road, social intelligence to read the intentions of other road users, and self control to restrain those expressive tendencies which result in the commission of Highway Code and Aggressive Violations. Our early studies, using what we now see as a composite measure of Violations, developed a psychological profile of the violating driver and demonstrated that they were 'crash magnets' (Stradling, 1997), being more likely to be involved in both active and passive crashes. More recently we have been able to show that violators, especially those who themselves are committing more Aggressive Violations, show higher levels of anger with other road users. They show certain demographic and car use characteristics, and the age and gender profile for the two types of Violations varies in intriguing ways, on which further research is needed in order to best design and target appropriate remediations.

We have attempted to summarise recent research on the driver characteristics that predict elevated crash-involvement, and this descriptive model (from Lajunen, 1997; Meadows and Stradling, 2000; Stradling et al, 2000) is shown in Figure 5.

Figure 5 Distal And Proximal Influences On Driver Crash Involvement



The model distinguishes a 'violation route' and an 'error route' to crash involvement. The two in combination can have fatal consequences. Generally peripheral factors influence more proximate factors - though a fully specified model would need to include a plethora of interactions and feedback loops to begin to do justice to the complexity of human behaviour on the road. For example, age and gender make documented differences to the factors below them on the violation route; age, gender and all the factors below them have documented links to crash involvement (e.g., Beirness, 1993; Elander et al, 1993; Jonah, 1997; Lajunen et al, 1998; Lawton et al, 1997b; Maycock et al, 1991; Parker et al 1995a,b).

A driver's driving style – and in particular, we believe, their tendency to commit the kinds of driving behaviours that we label Highway Code and Aggressive Violations – lies at the heart of the matter. Reducing the level of commission of violations would enhance safety margins and reduce the chances for interpolated error to have terminal consequences.

References

Aberg, L. and Rimmo, P-A. (1998) Dimensions of aberrant driver behaviour, **Ergonomics**, 41: 39-56.

Beirness, D.J. (1993) Do we really drive as we live? The role of personality factors in road crashes, **Alcohol, Drugs and Driving**, 9: 129-143.

Blockley, P.N. and Hartley, L.R. (1995) Aberrant driving behaviour: errors and violations, **Ergonomics**, 38: 1759-1771.

Deffenbacher, J.L., Oetting, E.R. & Lynch, R.S. (1994) Development of a driving anger scale. **Psychological Reports**, 74, 83-91.

Elander, J., West, R. and French, D. (1993) Behavioral correlates of individual differences in road-traffic crash risk: An examination of methods and findings, **Psychological Bulletin**, 113: 279-294.

Jonah, B. (1997) Sensation seeking and risky driving: A review and synthesis of the literature. **Accident Analysis and Prevention**, 29: 651-665.

Kontogiannis, T., Kossiavelou, Z. & Marmaras, N. (manuscript in submission, 2000) Self reports of aberrant behaviour on the roads: errors and violations in a sample of Greek drivers.

Lajunen, T. (1997) Personality Factors, Driving Style and Traffic Safety. PhD thesis, Faculty of Arts, University of Helsinki.

Lajunen, T., D.Parker & S.G.Stradling. (1998). Dimensions of driver anger, aggressive and highway code violations and their mediation by safety orientation in UK drivers. **Transportation Research Part F: Traffic Psychology and Behaviour**, 1, 107-121.

Lawton, R., D.Parker, A.S.R.Manstead & S.G.Stradling. (1997a). The role of affect in predicting social behaviours: The case of road traffic violations. **Journal of Applied Social Psychology,** 27, 1258-1276.

Lawton, R., D.Parker, S.G.Stradling & A.S.R.Manstead. (1997b). Predicting road traffic accidents: The role of social deviance and violations. **British Journal of Psychology**, 88, 249-262.

Lawton, R., D.Parker, S.G.Stradling & A.S.R.Manstead. (1997c). Self-reported attitude towards speeding and its possible consequences in five different road contexts. **Journal of Community & Applied Social Psychology**, 7, 153-165.

Manstead, A.S.R., D.Parker, S.G.Stradling, J.T.Reason, J.S.Baxter & D.A.Kelemen. (1992). Perceived consensus in estimates of the prevalence of driving errors and violations. **Journal of Applied Social Psychology**, 22, 509-530.

Maycock, G., Lockwood, C.R. and Lester, J.F. (1991) The Accident Liability of Car Drivers. TRRL Report RR315. Crowthorne: Transport and Road Research Laboratory.

Meadows, M.L. (1994). Psychological Correlates of Road Crash Types. PhD Thesis, University of Manchester.

Meadows, M.L. & S.G.Stradling (2000). 'Are women better drivers than men? Tools for measuring driver behaviour'. In J.Hartley & A.Branthwaite (Eds) The Applied Psychologist. 2nd Edition. Open University Press

Parker, D., T.Lajunen & S.G.Stradling. (1998). Attitudinal predictors of interpersonally aggressive violations on the road. **Transportation Research Part F: Traffic Psychology and Behaviour**, 1, 1-14.

Parker, D., A.S.R.Manstead, S.G.Stradling & J.T.Reason. (1992a). Determinants of intention to commit driving violations. **Accident Analysis and Prevention**, 24(2), 117-131.

Parker, D., A.S.R.Manstead, S.G.Stradling, J.T.Reason & J.S.Baxter. (1992b). Intention to commit driving violations: an application of the theory of planned behaviour. **Journal of Applied Psychology**, 77(1), 94-101.

Parker, D., A.S.R.Manstead & S.G.Stradling. (1995a) Extending the Theory of Planned Behaviour: The role of personal norm. **British Journal of Social Psychology**, 34, 127-137.

Parker, D., J.T.Reason, A.S.R.Manstead & S.G.Stradling. (1995b). Driving errors, driving violations and accident involvement. **Ergonomics**, 38(5), 1036-1048.

Parker, D., R.West, S.G.Stradling & A.S.R.Manstead. (1995c) Behavioural traits and road traffic accident involvement. **Accident Analysis and Prevention**, 27(4), 571-581.

Reason, J.T., A.S.R.Manstead, S.G.Stradling, J.S.Baxter & K.A.Campbell. (1990). Errors and violations on the road: a real distinction? **Ergonomics**, 33(10/11), 1315-1332.

Rothengatter, T. (1997) Errors and violations as factors in accident causation, in T. Rothengatter and E. Carbonell Vaya (Eds) Traffic and Transport Psychology. Theory and Application. Amsterdam: Pergamon.

Stradling, S.G. (1997). Violators as 'crash magnets', in G.B.Grayson (Ed.) Behavioural Research in Road Safety VII. Crowthorne: Transport Research Laboratory. (PA3296/97).

Stradling, S.G., A.S.R.Manstead & D.Parker. (1992). 'Motivational correlates of violations and errors on the road'. in G.B.Grayson (Ed.) Behavioural Research in Road Safety II. Crowthorne: Transport and Road Research Laboratory. (PA2193/92).

Stradling, S.G., R.Roberts, K.J.Harper, A.P.Tuohy, J.R.Adams & D.Parker. (1990). 'Police sanctions in changing driver behaviour'. pp 453-463 in T.Benjamin (Ed.) Driving Behaviour in a Social Context. Proceedings of the International Symposium organised by La Prevention Routiere, Paris, 16-18 May 1989. Caen: Paradigme.

S.G.Stradling, M.L.Meadows & S.Beatty. (1999) 'Factors Affecting Car Use Choices'. Edinburgh: Transport Research Institute, Napier University.

S.G.Stradling, T.Lajunen, & D.Parker. (2000) Inclinations and obligations, errors and violations: explaining driver behaviour. Symposium on Evaluating Theories in Driver Behaviour. International Conference on Traffic and Transport Psychology, Bern, 4-7 September 2000

Sullman, M. & M.L.Meadows. (2000) Errors, lapses and violations in the drivers of heavy vehicles. International Conference on Traffic and Transport Psychology, Bern, 4-7 September 2000.

Waller, P. (1997) Future possibilities for behavioural research, in G.B. Grayson (ed.) Behavioural Research in Road Safety VII. Crowthorne: Transport Research Laboratory (PA 3296/97).

West, R. (1995) Accident Script Analysis. Contractors Report CR343. Transport Research Laboratory.

Xie, C.Q., D.Parker & S.G.Stradling. Driver behaviour and its consequences: The case of Chinese drivers. International Conference on Traffic and Transport Psychology, Bern, 4-7 September 2000.