

An Application of the Driver Attitude Questionnaire to Examine Driving Behaviours within an Australian Organisational Fleet Setting

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ABSTRACT

This study reports on the utilisation of the Driver Attitude Questionnaire (DAQ) to examine the self-reported driving behaviours of a sample of Australian fleet drivers ($N = 443$). Surveys were posted to drivers who agreed to participate in the study. Univariate analyses of the four subscales revealed that participants were least concerned about speeding, followed by risky overtaking manoeuvres, while attitudes regarding the seriousness of close following and drink driving were significantly higher. Additional analyses revealed the speeding factor was associated with self-reported traffic offences, and was predictive of demerit point loss at a multivariate level, even after controlling for driving exposure (i.e., kms driven each year). This paper further outlines the major findings of the study and highlights implications regarding the utilisation of self-report measurement tools within fleet settings to examine on-road behaviour.

Present Context

Fleet and work related motor vehicle incidents represent a substantial emotional and financial cost to the community. It has been estimated that the total cost of work-related road incidents in Australia is in the vicinity of \$1.5 billion (Wheatley, 1997) and the average total insurance cost of a fleet incident to organisations and society is approximately \$28,000 (Davey & Banks, 2005). In general, a high proportion of work-related deaths and injuries as well as the road toll consist of work-related crashes. For example, work-related traffic injuries are about twice as likely to result in death or permanent disability than other workplace accidents (Wheatley, 1997) and account for up to 23% of work related fatalities in Australia and 13% of the national road toll (Murray et al, 2003). A further 26% of fatalities result from crashes which occur while commuting to and from work. This means that 49% of all work-related fatalities occur as a result of on-road crashes when commuting is also taken into account (NOHSC, 1999). As a result, there is an obvious and growing need for industry, government and the community to allocate resources to further knowledge and expertise in this area.

However, despite the economic and personal impact of fleet-related vehicle crashes, comparatively little national and international research has endeavoured to identify the underlying factors associated with increased risk of crash involvement. This appears a critical oversight as changes in industry/employer accountability, business processes, OH&S, workers compensation legislation, insurance, third party coverage and public liability are requiring industry to develop better benchmarking along with more comprehensive programs related to fleet safety. There is currently only a small amount of research in this area and estimates of the true cost for work related crashes suggest that hidden costs may be somewhere between 8-36 times vehicle repair/replacement costs (Murray et al, 2003).

Driving Assessment Tools

Given the increasing burden that road crashes have on society, researchers are beginning to direct focus towards investigating the attitudes and behaviours of general motorists', as well as identify the relationship these factors have with crash involvement. Such measurement tools include: the Driving Skill Inventory (Lajunen & Summala, 1997), Driver Anger Scale (Deffenbacher, Oetting & Lynch, 1994), the Manchester Driver Behaviour Questionnaire (DBQ) (Reason et al., 1990) and the Driver Attitude Questionnaire (DAQ) (Parker et al., 1996). The latter questionnaire has recently received increasing attention within the literature as researchers begin to identify driving attitudes associated with crash involvement (Anderson & Summala, 2004; Burgess & Webley, 2000; Davey et al., 2006; Meadows, 2002).

The DAQ was developed by Parker et al. (1996), and focuses on four distinct factors that aim to measure respondents' attitudes towards major driving issues (drink driving, following closely to other vehicles, risky overtaking & speeding).

The drink driving factor consists of items such as the perceived seriousness of drinking more than the legal limit and then driving, while the close following factor focuses on attitudes towards the acceptability of driving very closely to vehicles in front. The overtaking factor concentrates on whether it is safe to overtake in risky situations and the speeding factors focuses on identifying whether respondents believe it is safe to drive above the speed limit.

Research has begun to utilise the DAQ within a number of different applied settings such as: driver training programs (Burgess & Webley, 2000), bicycle interventions (Anderson & Summala, 2004), speed awareness training (Meadows, 2002) and fleet programs (Davey et al., 2006). For example, Burgess and Webley (2000) incorporated the DAQ as a measurement scale into a driver education program and reported that for the 1,439 participants, individuals were most likely to indicate the highest level of intolerance towards drink driving behaviours, followed by close following, and then dangerous overtaking, while participants were least concerned about speeding violations. In addition, Meadows (2002) found the DAQ to be a reliable measurement tool to examine the impact of a speed awareness program. Furthermore, Davey et al. (2006) utilised the DAQ in combination with a number of self-reported driving assessment questionnaires (e.g., DBQ & Climate Safety Questionnaire) to investigate the driving behaviours of 4195 fleet motorists in a large telecommunication organisation. The researchers found that participants reported the highest level of acceptance for speeding above the limit, while close following and risky overtaking procedures were reported as less acceptable. Interestingly, risky overtaking procedures was reported as a significant predictor of incurring demerit point loss while driving for work purposes.

However, despite the considerable proportion of professional drivers on public roads, relatively little research has endeavoured to examine the self-reported driving behaviours of those who drive company vehicles (Newnam et al., 2002; Newnam et al., 2004; Sullman et al., 2002; Xie & Parker, 2002). Furthermore, only a small body of research has attempted to identify the personal and environmental factors associated with crash involvement or incurring infringement notices for work-related driving. At present, a small body of research is beginning to demonstrate that company car drivers are at a greater risk of accident involvement than general motorists (Newnam et al., 2002; Sullman et al., 2002), and early research has indicated that self-reported data provided by fleet drivers can be utilised to predict demerit point loss i.e., committing a higher number of errors (Davey et al., 2006; Davey et al., in press). However, apart from these initial findings, very little research has endeavoured to examine the factors associated with crashes and fines within fleet settings. What remains evident is that considering the tremendous amount of kilometres driven by professional drivers within Australia each year, often under time pressures, there is a genuine need to examine the usefulness of self-reported assessment tools, such as the DAQ, to assess driving behaviours, as well as determine the relationship such factors have with the likelihood of crash involvement and traffic offences. As a result, the present research aimed to utilise the DAQ to investigate the self-reported driving behaviours of a group of Australian drivers within a fleet setting. More specifically the study endeavoured to:

- (a) examine a group of fleet drivers' attitudes regarding the seriousness of drink driving, close following, risky overtaking and speeding;
- (b) examine the utility of the DAQ to measure fleet driving behaviour (e.g., reliability); and
- (c) investigate the relationship the DAQ has with self-reported crash involvement and traffic offences.

METHOD

Participants

A total of 443 individuals volunteered to participate in the study who were all employees of a large Australian company. There were 345 (78%) males and 98 (22%) females. The average age of the sample was 44 years (range 18-68yrs).

Participants were located throughout Australia in both urban and rural areas. The largest proportion of vehicles driven by participants were reported to be for tool of trade (56%), although vehicles were also salary sacrificed (43%), and a small proportion were leased or participants' own vehicle (1%). Vehicles were reported to be sedans (85%), four wheel drives (12%) or other (3%).

The majority of driving by participants was reported to be within the city (46%), or in the city and on country roads (40%). On average participants had held their licence for 26 years (range 5 – 48yrs), had been driving a work vehicle for approximately 5 years (range 1 – 33yrs), with the largest proportion driving between 11 and 20 hours per week (43%), and between 30,000 – 40,000kms per year. A total of 48 participants reported being involved in a crash while driving for work in the last year¹ while 73 individuals reported incurring traffic infringements (i.e., demerit point loss) during the same time period. A crash was characterised by an accident that needed to be reported to management while a traffic infringement consisted of a driving offence e.g., speeding or red light infringement.

Materials

Driver Attitude Questionnaire (DAQ)

The DAQ is a 20-item self-report questionnaire designed to measure attitudes regarding a range of driving behaviours which are collated to identify four factors: drink driving, close-following, dangerous overtaking and speeding. Respondents are required to indicate on a six point likert scale (0 = strongly disagree to 5 = strongly agree) their agreement with statements regarding the appropriateness of various driving behaviours. Each factor consists of five questions, see Table 1.

Demographic Measures

A number of socio-demographic questions were included in the questionnaire to determine participants' age, gender, driving history (e.g., years experience, number of traffic offences and crashes) and their weekly driving exposure (e.g., type of car driven, driving hours).

Procedure

The participating organisation developed a list of individuals who expressed interest in participating in the research. A letter of introduction, the study questionnaire and a reply paid envelope were distributed through the company's internal mail system to the participants. In total 1440 were mailed out and 443 were returned indicating a 30% response rate.

RESULTS

Structure and Reliability of the Driver Attitude Questionnaire for an Australian Sample

The internal consistency of the DAQ scores were examined through calculating Cronbach's alpha reliability coefficients, which are presented in Table 1. While there has been little research to determine the psychometric properties of the DAQ, the results are similar to one previous study (Meadows, 2002), which has indicated factors exhibit relative internal consistency. Examination of the scores reveals that the items traditionally associated with close following (.66) and drink driving (.65) had the highest reliability coefficients, while speeding had the lowest reliability (.51).

Table 1. *Alpha reliability coefficients of the DAQ scale*

Alcohol	(5 items)	.65
Close Following	(5 items)	.66
Overtaking	(5 items)	.62
Speeding	(5 items)	.51

Table 2 reports the overall mean scores for the factors, with higher means revealing a more appropriate attitude towards the road safety factors. Examination of the mean scores indicates that of the four aberrant driving behaviours, participants were most likely to report that drink driving was generally an unacceptable behaviour in most circumstances ($M = 3.71$).

¹ This includes driving to and from work.

The second highest factor was close following, followed by attitudes regarding risky overtaking. In contrast, participants were most likely to report that speeding was an acceptable behaviour ($M = 2.76$). Between group analyses demonstrated that participants' attitudes towards the unacceptability of drink driving were significantly higher than risky overtaking practices $F(1, 443) = 80.73, p < .01$ as well as speeding $F(1, 433) = 94.42, p < .01$. The results indicate that drink driving is perceived as the most serious offence in the current sample, and similar to previous research (Burgess & Webley, 2000; Davey et al., 2006), speeding is often perceived as an acceptable behaviour in some circumstances.

In addition, Table 2 reports the mean and standard deviation scores for the four highest ranked items. While speeding was identified as the least serious driving offence, it is noteworthy that the four highest ranked items related to less safe attitudes towards close following, overtaking and drink driving factors: *Some people can drive perfectly safely even when they only leave a small gap behind the vehicle in front* ($M = 4.25, SD = .79$); *Close following is not really a serious road safety problem* ($M = 4.23, SD = .85$); *I think it is OK to overtake in risky circumstances as long as you drive within your own capabilities* ($M = 4.07, SD = .82$); *Some people can drive perfectly safely after drinking three or more pots of beer in an hour* ($M = 4.04, SD = 1.01$). The results indicate that respondents believed it was acceptable to engage in all four behaviours, in some circumstances, which may have contributed to the relatively low internal consistency reported previously.

Table 2. Mean Scores for the DBQ factors

Factors	<i>M</i>	<i>SD</i>
Alcohol*	3.71	.41
Close Following	3.36	.40
Overtaking	3.27	.48
Speeding	2.76	.49
Highest Ranked Items ²		
1. Some people can drive safe with only a small gap	4.25	.79
2. Close following is not really a serious road safety problem	4.23	.85
3. I think it is OK to overtake in risky circumstances	4.07	.82
4. Some people can drive safe after drinking three pots of beer	4.04	1.01

Intercorrelations between Variables

The bi-variate relationship between the samples' attitudes regarding the four DAQ sub-factors and employment related variables are depicted in Table 3. While the relationship between the major factors and incurring demerit point loss are examined in the following logistic regression analyses, some notable bi-variate relationships are reported below.

In regards to the association between the DAQ factors, the strongest relationship appeared to be between close following and overtaking ($r = .37^{**}$), as participants who reported an unwillingness to engage in risky overtaking manoeuvres were also more likely to report following closely to other vehicles was another unacceptable behaviour. In addition, beliefs that close following was unacceptable was also significantly associated with drink driving ($r = .26^{**}$) and speeding ($r = .21^{**}$). In regards to sample characteristics, the only notable relationships were found between age and overtaking ($r = .11^*$) and close following ($r = .20^{**}$), as older drivers were more likely to report a lower level of acceptance towards such aberrant driving behaviours³.

² These four items were reversed scored when calculating overall means for the sub-factors as lower mean scores indicate less safe driving attitudes. Scores represent mean of the five items.

³ It is noted that the correlations between the factors are relatively small, but are consistent with previous road safety research that utilises social science research methods.

Table 3. Pearson correlations between the major driving variables

	1	2	3	4	5	6	7	8	9	10
1. DAQ Overtaking	1	.10*	.37**	.21**	.11*	.60	-.05	-.02	-.08	-.02
2. DAQ Speeding		1	.27**	.21**	-.05	-.09	.01	.05	.00	.10*
3. DAQ Close Following			1	.26**	.20**	.14**	-.02	.01	-.03	-.04
4. DAQ Alcohol				1	.04	.03	-.04	-.10*	.01	-.01
5. Age					1	.83**	.10*	.07	-.06	.00
6. Years Licensed						1	.11*	.10*	-.07	-.04
7. Hours per week							1	.56*	.08	.61
8. Klms per year								1	.06	.14*
9. Crashes 12 mths									1	.21**
10. Fines 12 mths										1

Prediction of Offences

The third part of the study aimed to examine the relationship between participants' driving attitudes as measured by the DAQ and self-reported work crashes and demerit points. Due to the relatively small number of participants who reported a work-related crash in the last 12 months ($N = 48$), it was not possible to implement regression analyses and thus the following analyses focus on predicting work-related driving infringements ($N = 73$)⁴. A logistic regression analysis was performed to examine the contributions of the DAQ factors (e.g., overtaking, speeding, close following and alcohol), as well as driving exposure (e.g., kilometres driven each year & hours driving per week) to the prediction of self-reported infringements in the past 12 months.

Table 4 depicts the variables in each model, the regression coefficients, as well as the Wald and odds ratio values. Self-reported numbers of kilometres driven each year and hours of driving per week were entered in the first step to examine, as well as control for, the influence of driving exposure before the inclusion of the DAQ factors. As expected, the number of kilometres driven per year was predictive of incurring demerit point loss ($p = .001$) as those who drive longer distances are at a greater risk.

Next, the four DAQ factors (alcohol, close following, overtaking and speeding) were entered in the model to assess whether the proposed attitudes towards driving improved the prediction of demerit point loss over and above exposure to driving (Step 2). The additional variables collectively were significant, with a chi-square statistic of $X^2(4, N = 443) = 10.79, p = .03$, as was the speeding variable. The model indicates that as participants' attitudes towards speeding becomes more lenient, the corresponding likelihood of incurring demerit point loss increases ($p = .010$)⁵. Several additional regression models were estimated to determine the sensitivity of the results. A test of the full model with all six predictors entered together, as well as the two models entered separately, confirmed the same significant predictors (e.g., exposure and speeding). Forward and Backward Stepwise Regression identified the same predictors. Inclusion of gender, age and years driving experience did not increase the predictive value of the model.

⁴ It is noted that as speeding is the easiest offence to detect, there is more opportunity behaviourally to do it, and would therefore be expected to show up well in the model.

⁵ The model correctly predicted 45.5% of participants who incurred an infringement notice.

Table 3. Logistic Regression Analysis with Demerit Point loss as the Dependent Variable

Variables	B	SE	Wald	<i>p</i>	Odds ratio	95% C.I. Exp (B)	
						Lower	Upper
Step 1							
Hours per week	-.15	.17	.79	.373	.857	.76	1.11
Kms per year	.40**	.09	14.24	.000	1.41	1.19	1.92
Model Chi-Square 16.27** (df = 2)							
Step 2							
Hours per week	-.69	.18	.88	.348	.845	.91	1.10
Kms per year	.35**	.09	13.02	.000	1.42	1.21	1.85
Alcohol	-.35	.09	.14	.703	.87	.99	1.17
Close Following	-.50	.36	1.91	.167	.60	.77	1.01
Speeding	-.78*	.30	6.62	.010	2.19	.98	1.55
Overtaking	-.01	.30	.00	.959	.985	.78	1.09
Model Chi-Square 23.90** (df = 6)							
Block Chi-Square 10.79* (df = 4)							

Note. * $p < .05$, ** $p < .01$.

DISCUSSION

The present research aimed to utilise the DAQ to conduct one of the first investigations into the driving behaviours of a group of Australian fleet drivers. More specifically, the study aimed to investigate the attitudes of a group of professional drivers and determine whether such attitudes were predictive of crash involvement and demerit point loss. At present, scant research has endeavoured to examine the self-reported driving behaviours of professional drivers (Davey et al., in press; Newnam et al., 2004; Wills et al., 2004), or investigate the predictive utility of driving measurement tools to identify those at risk of crash involvement or demerit point loss (Davey et al., in press; Sullman et al., 2002).

Firstly, analysis of the DAQ's reliability indicated coefficients that were moderately robust and were similar to previous research in the area (Meadows, 2002). However, given that the speeding factor's alpha coefficient was identified to be .51, further research appears necessary within fleet arenas to determine the DAQ's psychometric properties and thus the reliability of the measurement tool. Secondly, examination of the overall mean scores of the four factors revealed that participants believed drink driving was the most unacceptable offence. The results are consistent with previous research which has demonstrated DAQ respondents are likely to indicate that drink driving is the most unacceptable behaviour of the four subcategories (Burgess & Webley, 2002; Davey et al., 2006). The findings also support current initiatives (e.g., media campaigns & police blitzes) which aim to promote the message that drink driving is a serious road safety concern. A similar finding was also noted for close following, which is again consistent with previous research (Meadows, 2002; Davey et al., 2006), indicating motorists believe this behaviour to be a serious safety risk. Concern towards overtaking was marginally lower than for close following, although it is noted that participants did not adamantly report overtaking in risky situations to be an unacceptable behaviour (e.g., $M = 3.27$).

An interesting finding was that participants reported the highest levels of acceptance for speeding behaviour(s). This finding is once again consistent with previous driving research (Dimmer & Parker, 1999; Lajunen et al., 2003; Parker et al., 1995), and in particular fleet safety research (Davey et al., in press), which has reported speeding violations are the most common form of aberrant driving behaviour both exhibited and reported by motorists.

Furthermore, recent research has reported that fleet drivers hold a general belief that minor speeding violations are acceptable in some circumstances (Davey et al., in press; Newnam et al., 2004), and given the considerable time pressures often placed on professional drivers in work settings, the present finding appears to confirm that this group of motorists are at risk of engaging in speeding-related driving infringements.

In regards to the relationship between the four DAQ factors, similar to previous research on general motorists (Meadows, 2002), positive correlations were evident between the drink driving, close following, overtaking and speeding factor. This finding may suggest that while the four factors are conceptual distinct, at some level, they may reflect related attitudes towards driving behaviours. For example, the strongest relationship appeared to be between close following and overtaking, which may indicate those who are unwilling to take risks while overtaking are also more cautious about following too closely to other vehicles. That is, the factors may derive from a common theme regarding tolerance levels to engage in risky driving behaviours. However, it is also recognised that this finding may stem from common method variance and/or social report bias, as participants who report moderate attitudes towards one form of unsafe driving behaviour may also be more likely to report lenient attitudes towards other forms of aberrant driving (Davey et al., in press). Further research that includes a more refined examination of the possible relationships between the factors may prove fruitful in identifying if the association is affected by the purpose of the driving task i.e., personal vs work.

In regards to the prediction of self-reported driving offences and crashes, only a small proportion of the sample reported being involved in a crash within the last year, which contributed to difficulties identifying factors associated with the event. While the time period to examine the incidence of crashes in the current study may have been relatively short (i.e., 1 year), accidents remain a relatively rare event and the current findings support research that suggests an aggregate of different driving behaviours/offences may be required to obtain an accurate measure of driving performance (Davey et al., in press; Ulleberg & Rundmo, 2003). Subsequently, an examination of self-reported driving violations (i.e., infringement notices) revealed a larger proportion of the fleet drivers reported incurring demerit point loss while driving for work purposes compared to crash involvement. A step wise logistic regression analysis revealed that both exposure to the road and lenient attitudes towards speeding were predictive of reporting driving violations. Firstly, exposure to the road was expected to be a significant predictor given that increasing driving distances is likely to increase the probability of deliberately or unintentionally making driving errors which may lead to demerit point loss. Secondly, speeding was also identified as a predictor of demerit point loss and is of particular importance. Not only did the majority of the sample report that speeding was a generally acceptable driving behaviour in some circumstances, but this factor also predicted demerit point loss, over and above, exposure to the road. Given that speeding may be considered one of the most likely methods to incur infringement notices, it may not be surprising that attitudes towards speeding are predictive of fines. However, future research that identifies the particular reason for motorists' demerit point loss (i.e., speeding vs errors) may provide for a more refined analysis to determine the specific contribution of speeding to driving infringements and even crash involvement. Despite this, the current study confirms previous research which has demonstrated that individuals who spend longer periods on the road are at a greater risk of engaging in aberrant driving behaviours (Davey et al., in press; Sullman et al., 2002), as well as highlights the negative affect speeding can have on driving outcomes.

In regards to fleet safety practice, the above findings and further research into fleet drivers has the potential to assist in the development of targeted interventions and strategies aimed at addressing factors contributing to unsafe driving behaviours. For example, close-following and risky overtaking manoeuvres have direct implications for other road users (Burgess & Webley, 2000) and identifying individuals within fleet environments who engage in such behaviours has potential benefits in regards to early intervention. For example, utilising the DAQ and other driving measurement tools to gather self-reported information provides a proactive opportunity to gain an organisational perspective of the type of behaviours exhibited by fleet drivers (Davey et al., in press). This process may lead to the development of targeted interventions aimed at reducing the likelihood of a work-related crash before the event occurs, rather than on the traditional post hoc basis (Davey et al., in press).

These interventions can take a number of forms, ranging from the production of safety flyers, emails through to specific programs for high risk individuals who continue to display inappropriate driving behaviours.

Limitations

A number of limitations should be taken into account when interpreting the results of this study. The response rate of participants was relatively low, and similar to research in this area, concerns remain regarding the reliability of the self-reported attitudes, such as the propensity for professional drivers to provide socially desirable responses. "In addition, the current study focused on measuring attitudes and self-reported behaviours, and a disparity may exist between such attitudes and self-reported, as well as displayed behaviours." Questions also remain about the representativeness of the sample as participants were mainly corporate fleet drivers (e.g., involved in insurance sales) and such driving styles may not be easily transferable to other fleet driving populations. In addition, the psychometric qualities of the DAQ remain in doubt as the Cronbach Alpha scores calculated for the current study were quite low e.g., .66-.51. Thus, it is acknowledged that the relatively poor reliability of the questionnaire items for the four factors reduces confidence in the results. In summary, further research is required to establish the reliability and validity of the scale for the Australian setting and the usefulness of the tool to provide direction for fleet safety interventions. Such endeavours may result in some items being modified or removed to increase the internal reliability of the scale.

Despite the above limitations, the results of the present research indicate that the DAQ may have the potential to be successfully utilised to examine fleet drivers' attitudes towards road safety factors within the Australian context. However, further research appears necessary to not only determine the possible links between self-reported attitudes and subsequent exhibited behaviours by fleet drivers, but also the most effective methods to create attitudinal and behavioural change with such populations. While conducting research in applied settings such as fleet environments may prove costly in terms of both time and money, the collection of accurate data regarding fleet drivers' performance appears vital if effective interventions and countermeasures are to be developed that ultimately reduce the burden of work-related crashes.

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