A Study Predicting Self-Reported Crashes Among Fleet Drivers

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ABSTRACT

This study reports on the utilisation of the Manchester Driver Behaviour Questionnaire (DBQ), Driver Attitude Questionnaire (DAQ) and Safety Climate Questionnaire (SCQ) to examine the self-reported crash involvement of a sample of Australian fleet drivers (N = 4195). Questionnaires were distributed through the company's internal mail system to participants. Univariate analyses identified that drivers were more likely to report engaging in speeding behaviours and believed speeding was more acceptable compared to drink driving, following too closely or engaging in risky overtaking manoeuvres. However, multivariate analyses implemented to determine factors associated with crash involvement revealed that increased work pressure as well as driving mistakes (i.e., errors) were predictive of crashes, even after controlling for exposure to the road (i.e., kilometres driven per year). This paper will further highlight the major findings of the study as well as possible implications regarding the predictive utility of self-report questionnaires to investigate driving behaviours.

Present Fleet Context

Work-related drivers are often defined as those who drive at least once a week for work purposes and research suggests that up to 30% of registered vehicles in Australia are work vehicles (Haworth, Tingvall & Kowadlo, 2000). Such vehicles often travel considerable distances, often comprises up to half the vehicle traffic stream at any one time and as a result, are often disproportionately represented in crash statistics (Haworth et al., 2000). For example, research consistently demonstrates that traffic crashes are one of the largest contributors to work-related fatalities in Australia (Harrison, Mandryk & Frommer, 1993; National Occupational Health and Safety Commission, 1998). Preliminary findings have demonstrated that approximately 40 work-related road fatalities are recorded each month in Australia (Wheatley, 1997), and this phenomenon has become the most common form of work-related injury (Haworth et al., 2000). In addition to the enormous personal toll work crashes have on individual lives, the economic cost of work-related crashes has been estimated to cost Australia \$425 million each year (Wheatley, 1997), with the average crash costing approximately \$18,500 (Stewart-Bogle, 1999). Interestingly, research has demonstrated that work-related drivers on average report a higher level of crash involvement compared to personal car drivers (Downs et al., 1999; Lynn & Lockwood, 1998).

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. Some useful 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), Driver Attitude Questionnaire (DAQ) (Parker et al., 1996) and the Safety Climate Questionnaire-MD (SCQ-MD) (Glendon & Litherland, 2001). The latter three questionnaires are proving increasingly popular in identifying the factors associated with vehicle crashes and demerit point loss among fleet drivers in work settings, and will remain the focus of the present study.

Firstly, the DBQ has been extensively utilised within a range of driver safety research areas such as: the genetics of driving behaviour (Bianchi & Summala, 2004), age differences in driving behaviour (Dobson et al., 1999), cross cultural studies (Lajunen et al., 2003) and associations with the likelihood of being involved in an accident (Dobson et al., 1999; Mesken, Lajunen & Summala, 2002; Parker et al., 1995; Reason et al., 1990). Such research has predominantly focused on general motorists, which has indicated that speeding violations are one of the most common factors associated with crash involvement (Parker et al., 1995).

Secondly, another measurement tool which is beginning to receive increasing attention within the road safety literature is the Driver Attitude Questionnaire (Parker et al., 1996).

Research has begun to utilise the DAQ within a number of different applied settings such as: speed awareness training (Meadows, 2002), general driver training programs (Burgess & Webley, 2000), bicycle interventions (Anderson & Summala, 2004), as well as fleet programs (Davey et al., 2006). Preliminary research indicates that the DAQ has the potential to be implemented to investigate motorists' attitudes towards key road safety issues, such as drink driving, risky overtaking, close following and driving above the speed limit, with motorists generally reporting the most lenient attitudes towards speeding violations (Davey et al., 2006; Meadows, 2002).

Thirdly, the Safety Climate Questionnaire-Modified for Drivers (SCQ-MD) is also being utilised within road safety arenas, as researchers begin to recognise the importance of an organisation's attitudes towards fleet and road safety issues. In simple terms, "climate" relates to how employees perceive the organisational culture and practice of a company (Glendon & Stanton, 2000), and it is hypothesised that this perception impacts upon the way in which workers ultimately behave at work (Wills, 2006). In regards to safety climate, a growing body of research is demonstrating a link between safety culture and a variety of outcomes, ranging from vehicle crash rates (Diaz & Cabrera, 1997; Mearns, Flin, Gordon, & Fleming, 1998; Mearns, Whitaker & Flin, 2003), to injury severity (Gillen, Baltz, Gassel, Kirsch & Vaccaro, 2002). For example, Wills, Watson and Biggs (in press) investigated the driving behaviours of 323 fleet employees and reported that work pressure and communication were significantly related to driver distraction. Also, Newnam, Watson and Murray (2002) also examined the self-reported driving behaviours of fleet drivers and reported that the safety policies and practices within organisations had a direct impact on driving performance. Taken together, research is beginning to suggest that perceptions regarding the safety policies and practices of organisations may have a direct impact on driving outcomes.

Fleets

Despite the prevalence of research currently focusing on identifying the self-reported attitudes and behaviours that influence crash involvement, relatively little research has endeavoured to examine the self-reported driving behaviours of those who drive company sponsored vehicles and/or spend long periods of time behind the wheel (Newnam et al., 2002; Newnam et al., 2004; Sullman et al., 2002; Xie & Parker, 2002). What is presumed is that drivers of employer owned vehicles who drive for work-related purposes generally engage in a higher prevalence of aberrant driving behaviours such as speeding (Stradling, 2000), and are at greater risk of crash involvement due to their exposure to the driving environment (Newnam et al., 2002; Sullman et al., 2002). Preliminary evidence suggests that speeding is the most likely illegal behaviour to be reported by fleet drivers (Davey et al., in press; Dimmer & Parker, 1999) and dangerous driving is a major contributing factor in work-related crashes (Donoho, 1996). However, further research appears necessary to determine what self-reported measurement tools are most useful within fleet settings as well as what specific attitudinal and behavioural factors predict crash involvement within such settings. As a result, the present research aimed to utilise three prominent driving measurement tools to investigate the relationship between self-reported attitudes, behaviours and crash involvement. More specifically, the study aimed to:

- a) examine a group of fleet drivers' attitudes and behaviours regarding road safety issues via three measurement tools (i.e., DBQ, DAQ & SCQ-MD); and
- b) investigate the relationship the sub-factors of the measurement tools have with self-reported crash involvement.

METHOD

Participants

A total of 4195 individuals from a large Australian company volunteered to participate in the study. There were 4195 males (88.9 %) and 553 females (11.1%). The average age of the sample was 43.7yrs (range 18-66 yrs).

Participants were located throughout Australia in both urban and rural areas. The sample consisted of approximately equal numbers of office workers, n = 2244, (46.8 %) and field workers, n = 2264, (47.2 %), with n = 284, (5.9 %) respondents not indicating their employment type.

Examination of vehicle types revealed that the largest proportion of the sample reported driving sedans (n = 2872, 61.2%), followed by station wagons (n = 1375, 28.69%), vans (n = 861, 18%), and "customer service vehicles" (CSV) (n = 518, 11%), with only a small percentage indicating usage of four wheel drive vehicles¹, utes or heavy vehicles. The majority of driving by participants was reported to be within the city n = 1988 (42.4 %), or in the city and on country roads n = 1867(39.82%), with only 767 participants (16.36%) reporting driving only on rural roads. On average, participants had held their licence for 26 years. A total of 588 participants reported being involved in a crash while driving for work in the past 12 months.

Materials

Driver Behaviour Questionnaire (DBQ)

A modified version of the DBO was used in the current study that consisted of 20 items. Ouestions relating to lapses were omitted due to previous research indicating that this factor is not associated with crash involvement (Lawnton et al., 1997). In addition, the authors of the current paper made minor re-wording or rephrasing modifications, in order to make the questionnaire more representative of Australian driving conditions. For example, references to turning "right" were removed from the original questionnaire as there are instances in Australia where drivers may attempt to overtake someone who is turning left². Respondents were required to indicate on a six point scale (0 = never to)5 = nearly all the time) how often they commit each of the errors (8 items), highway code violations (8 items) aggressive violations (4 items).

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.

Safety Climate Questionnaire (SCQ)

A 29 item version of the SCQ was utilised in the research project. Minor modifications ensured that the questions related specifically to "work-related driving". The SCQ contains 5 sub-factors that aim to measure perceptions towards fleet safety rules, communication and support, work pressures, adequacy of fleet safety procedure and management commitment. A growing body of research has demonstrated that the SCQ is a reliable tool to measure fleet drivers' attitudes towards the safety climate of an organisation (Wills et al., 2006; Wills et al., in press).

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

An organisation operating a large Australian fleet provided 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.

¹ Other than the "CSV" body type.

² Previous research has demonstrated that the DBQ is robust to minor changes to some items in order to reflect specific cultural and environmental contexts (Blockey & Hartley, 1995; Ozkan & Lajunen, 2005; Parker et al., 2000).

RESULTS

Structure and Reliability of the Questionnaires for an Australian Sample

The internal consistency of the DBQ, DAQ and SCQ-MD scores were examined through calculating cronbach's alpha reliability coefficients, and are presented in Table 1. The SCQ factors, which specifically relate to safety, appear to exhibit the highest level of internal consistency. Similar to previous Australian research (Blockey & Hartley, 1995; Dobson et al., 1999), and on professional drivers (Sullman et al., 2002), the DBQ factors also appear to exhibit relative internal consistency. In contrast, there has been little research to determine the psychometric properties of the DAQ, and although only moderate, the alpha coefficients are similar to previous research (Meadows, 2002).

Table 1 also displays the overall mean scores for the DBQ, DAQ and SCQ-MD factors. Higher means on the DBQ indicate more deviant driving behaviours, while higher scores on the DAQ and SCQ-MD indicate more appropriate road safety attitudes, and positive perceptions regarding the organisation's road safety culture, respectively. Firstly, an examination of the mean scores reveals that for the DBQ scale, participants were most likely to engage in speeding offences while at work, which was significantly more likely compared to committing driving errors F(1, 4195) = 70.73, p < .01 or aggressive violations F(1, 4195) = 83.42, $p < .01^3$. The results indicate that speeding is the most common form of aberrant behaviour reported by the fleet drivers in the current sample, and similar to previous research on professional drivers (Newnam et al., 2004; Sullman et al., 2002), speeding remains a major road safety concern (Davey et al., 2006).

Secondly, an examination of participants' attitudes (DAQ) revealed respondents were most concerned about close following (M = 4.00), however it is noted that the sample also believed it was generally unacceptable to drink and drive, speed, as well as engage in risky overtaking manoeuvres in some circumstances. The results indicate that attitudes towards close following are the most stringent reported by the fleet drivers in the current sample, and similar to previous research (Meadows, 2002; Parker et al., 1995), speeding is the most accepted aberrant driving behaviour. However, it is noted the differences between the factors are relatively small and may therefore diminish the practical significance of the findings. In contrast to the self-reported behaviours and attitudes, participants reported the organisation promoted positive and adequate road safety rules (M = 4.14), fostered a commitment to road safety (M = 4.18), and were able to communicate and receive support regarding road safety issues (M = 3.83). However, it is also noted that participants reported some level of work pressure (M = 3.53). These differences between the various questionnaires' factors will be examined further in the following section.

³ However, it is noted that the mean scores for all three DBQ factors are relatively low, which indicates participants generally reported that they did not regularly engage in the specified aberrant driving behaviours.

Table 1. Alpha reliability coefficients of the Measurement Scales

Measurement Scale	Alpha	M	SD		
DBQ					
Errors	(8 items)	.78		1.36	.38
Highway Code Violations	(8 items)	.77	1.50	.47	
Aggressive Violations	(4 items)	.56	1.38	.43	
DAQ					
Alcohol	(5 items)	.67	3.84	.66	
Close Following	(5 items)	.67	4.00	.59	
Overtaking	(5 items)	.55	3.84	.56	
Speeding	(5 items)	.67	3.55	.66	
SCQ					
Fleet Safety Rules	(3 items)	.74	4.33	.46	
Communication & Support	(8 items)	.89	3.83	.50	
Work Pressures	(8 items)	.93	3.53	.18	
Adequacy of Procedures	(3 items)	.86	4.14	.43	
Management Commitment	(7 items)	.93	4.18	.60	

Intercorrelations between Variables

An examination was undertaken to determine the bi-variate relationships between the DBQ, DAQ, SCQ-MD factors as well as socio-demographic variables. While the association between the major factors and crash involvement are examined in the following logistic regression analyses, some notable bi-variate relationships are reported below.

As expected, strong relationships appeared evident between the DAQ factors, with the highest correlation being between close following and risky overtaking (r = .69**). That is, those who reported an unwillingness to engage in risky overtaking manoeuvres were also unlikely to perceive close following as an acceptable driving behaviour. Similar results were also found between the DBQ factors, with the strongest bi-variate relationship identified between highway code and aggressive violations (r = .53**). For example, those who engaged in highway code violations (i.e., speeding) were also more likely to exhibit aggressive acts while driving. Weaker correlations were generally evident between the SCQ factors, although fleet safety rules and adequacy of procedures were highly correlated (r = 54**).

In regards to bi-variate relationships between the questionnaires, significant negative correlations were evident between all the DBQ and DAQ subfactors (i.e., behaviours vs attitudes), as those who perceived aberrant driving behaviours such as speeding as serious were subsequently less likely to actually engage in such behaviours over the previous six month period (i.e., r = -.33**). Similar negative correlations were identified between the DBQ and SCQ-MD factors, as the perceived positive work environment which provided fleet safety rules, procedures and support resulted in lower levels of self-reported aberrant driving behaviour. For example, adequate fleet safety rules were negatively correlated with driving errors (r = -.21**), highway violations (r = -.23**) and aggressive violations (r = -.15**). In regards to sample characteristics, a similar negative relationship was found between age and the DBQ factors, as older drivers were less likely to engage in aberrant driving behaviours as well as report positive attitudes towards road safety, as measured by the DAQ. Finally, participants who drove further distances were less likely to report positive driving attitudes as measured by the DAQ, although this did not necessarily result in a higher frequency of engagement in aberrant driving behaviours, such as speeding and aggressive violations as measured by the DBQ.

However, making a higher number of driving errors in the last six months was positively associated with self-reported work pressure (r = .25**).

Prediction of Work Crashes

The third part of the study aimed to examine the relationship between participants' driving attitudes and behaviours as measured by the DAQ, DBQ, SCQ-MD and self-reported work crashes. A total of 588 participants reported being involved in a crash while driving for work in the last year. A logistic regression analysis was performed to examine the contributions of the DAQ factors (e.g., overtaking, speeding, close following and alcohol), DBQ factors (e.g., highway code violations, aggressive violations and errors), SCQ-MD factors (rules, communication, work pressure, procedures and management commitment) as well as exposure to driving (e.g., kilometres driven each year and hours driving per week) to the prediction of self-reported crashes in the past 12 months.

Table 2 depicts the variables in each model, the regression coefficients, as well as the Wald and odds ratio values. Self-reported number 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 proposed attitudinal and behavioural factors. As expected, participants who reported a higher level of driving exposure (i.e., kilometres per year) were most likely to indicate that they had been involved in a work-related crash in the past 12 months, p = .000.

Next, the DBQ, DAQ factors and SCQ-MD factors were entered in the model to assess whether the proposed attitudes and behaviours improved the prediction of crash involvement, over and above exposure to driving (Step 2). The additional variables collectively were significant, with a chi-square statistic of X^2 (12, N = 4195) = 51.59, p = .000. The model indicates that participants who reported a higher number of driving errors were most likely to be involved in a work-related crash (p = .007). Furthermore, reporting a higher level of work pressure was also predictive of crash involvement (p = .010). Several additional regression models were estimated to determine the sensitivity of the results. A test of the full model with all 14 variables entered together, as well as the two models entered separately, confirmed the same significant predictors (e.g., exposure, errors and work pressure). The inclusion of gender, age and years driving experience did not increase the predictive value of the model.

Table 2. Logistic regression analysis with self reported crash involvement as the dependent variable

Variables	В	SE	Wald	p	Odds ratio	95% C.I. Exp (B)	
						Lower	Upper
Step 1							
Hours per week	21	.13	1.41	.200	.811	.79	1.91
Kms per year	.16**	.02	42.64	.000	1.72	1.12	1.23
Model Chi-Square 4	0.61** (df	= 2)					
Step 2							
Hours per week	32	.17	.77	.308	.74	.92	1.18
Kms per year	.13**	.03	23.83	.000	1.13	1.08	1.19
Errors	.37*	.14	7.27	.007	1.44	1.11	1.88
Highway code	.05	.13	.15	.702	1.05	.81	1.35
Aggressive	.13	.13	1.04	.317	1.14	.89	1.46
Alcohol	10	.08	.02	.906	.99	.85	1.15
Close Following	.09	.11	.68	.415	1.09	.88	1.35
Speeding	03	.07	.13	.724	.97	.84	1.12
Overtaking	04	.11	.15	.693	.96	.77	1.20
Fleet safety rules	.12	.07	2.83	.091	1.13	.98	1.30
Communication	11	.08	1.66	.200	.90	.76	1.06
Work pressure	18*	.07	6.17	.010	.84	.72	.96
Procedures	.04	.10	.20	.65	1.05	.86	1.27
Management	04	.10	.14	.71	.96	.79	1.17
Model Chi-Square 9	2.20**	(df =	13)				
Block Chi-Square 5		(df =	/				

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

DISCUSSION

The present paper aimed to report on the utilisation of a range of self-report driving measurement tools (e.g., DAQ, DBQ & SCQ-MD) to conduct an investigation into the driving behaviours of a group of Australian fleet drivers. In addition, the research aimed to investigate whether professional drivers' attitudes and behaviours regarding road safety issues were predictive of crash involvement while driving for work purposes. Presently, only a small body of research has examined the self-reported driving attitudes and behaviours of fleet drivers (Newnam et al., 2004; Sullman et al., 2002), despite the potential for such data to be utilised in fleet interventions designed to reduce the burden of crash involvement.

Firstly, analysis of the measurement tools' internal consistency through alpha coefficients indicated that the DBQ and SCQ-MD were moderately robust, with the results similar to previous research that has utilised the questionnaires (Blockey & Hartley, 1995; Dobson et al., 1999; Sullman et al., 2002; Wills, 2006). However, the DAQ's internal consistency was relatively low, and as the scale has not been extensively validated within the literature, it appears that further research is necessary to determine the psychometric properties of the questionnaire, and its subsequent usefulness within fleet research.

Secondly, examination of the mean scores for the DBQ, DAQ and SCQ-MD factors revealed that participants generally reported positive attitudes and behaviours towards road safety. In regards to

attitudes, similar to previous research (Davey et al., 2006; Meadows, 2002), respondents reported close following and drink driving as the most serious driving behaviours.

Participants also reported that risky overtaking practices were an additional unacceptable behaviour, while attitudes towards speeding were more lenient. This finding is consistent with research which has indicated speeding is the most common form of aberrant driving behaviour reported by motorists (Davey et al., in press; Dimmer & Parker, 1999; Lajunen et al., 2003; Parker et al., 1995).

In regards to the relationship between the measurement tools, negative associations were identified between attitudes and the corresponding behaviours. That is, participants who agreed with the seriousness of the specified aberrant driving behaviours were less likely to report engaging in such behaviours over the past six months (e.g., DBQ speeding factor). Furthermore, the bi-variate correlations also provided a preliminary indication that the culture of the organisation, in particular the direction provided by the management team, is associated with driving behaviours. For example, the collected data generally indicates that the current organisation provided clear fleet safety rules, appropriate communication and support as well as strong management commitment, which was negatively associated with engaging in the aberrant driving behaviours. While only preliminary, the results indicate that the "safety climate⁴" of a fleet organisation has the potential to directly impact upon the driving outcomes exhibited by employees.

Despite the positive appraisal regarding the safety climate of the organisation, 588 participants reported being involved in a work-related accident in the past 12 months. In regards to the prediction of self-reported crash involvement while driving for work purposes, a number key factors were identified. Firstly, it appears that greater exposure to the road, such as driving more kilometres per annum, increases drivers' chances of being involved in a crash. While not surprising, the results may provide an opportunity for fleet managers to identify those at risk of crash involvement through exposure, and ensure such drivers receive appropriate interventions and supervision to reduce the likelihood of being involved in an accident. Secondly, the logistic regression analyses indicated that making a higher number of errors as well as reporting higher levels of work pressure were both predictive of work crashes. Interestingly, these two predictive variables were also correlated at a bivariate level, as those who reported increased work pressure were also more likely to report committing a higher number of driving errors in the past six months (r = .25**). Further research appears necessary to determine whether there is a causal link between work pressure and committing errors, as early evidence suggests fatigue related issues are a contributor to crash involvement (Haworth et al., 2000).

In summary, the results may prove to have direct implications for fleet interventions, not only through monitoring the driving performance of employees and the corresponding level of perceived work pressure, but also through proactive measures to reduce the likelihood of drivers making driving errors e.g., appropriate rest breaks, training, etc. Given the tremendous personal and economic cost of vehicle crashes in Australia, further research that endeavours to identify an appropriate balance between productivity and personal safety within fleet settings may prove beneficial at a number of levels.

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⁴ Safety climate has been defined as a psychological product of the behavioural and cultural ingredients within an organisation (Wills et al., in press).

Limitations

Some limitations should be borne in mind when interpreting the results of this study. The response rate of participants was relatively low, but consistent with previous research that has attempted to investigate fleet drivers (Davey et al., in press; Newman et al., 2002). Concerns remain regarding the reliability of the self-reported data, such as the propensity of professional drivers to provide socially desirable responses. Further research is also required to establish the reliability and validity of the scales for the Australian setting, especially the psychometric properties of the DAQ. Finally, it is also noted that a number of additional factors not examined in the current study, both personal and environmental, may influence as well as cause a vehicle-crash.

Despite such limitations, the findings provide evidence that specific driving behaviours and attitudes can be identified that have direct links to crash involvement. As a result, the development and implementation of effective fleet safety interventions designed to reduce the risk of drivers becoming involved in accidents has the potential to make a practical contribution to road safety. Currently, popular safety initiatives in the fleet industry include; selecting safer vehicles, safety programs, driver incentives, driver selection and induction programs, driver training/education programs, fleet safety guidelines and crash monitoring (Haworth et al., 2000). However researchers readily admit that comprehensive examinations regarding the implementation of such initiatives in fleet settings are limited, and at present, empirical evaluations are scarce (Haworth et al., 2000). Despite this, fleet safety practitioners are recognising the importance of developing and improving current fleet safety cultures in the industry (Downs et al., 1999; Haworth, 2002; Moser, 2001). What appears evident is that the implementation of effective self-reported driving measurement tools that accurately identify at-risk drivers may be one of the fist steps to inform the development of intervention programs designed to improve fleet safety, and thus road safety in general.

REFERENCES

- Anderson, A., & Summala, H. (2004). Commuter bicyclists' self image, attitudes, behaviour and accidents. Paper presented at the Third International Conference on Traffic and Transport Psychology, University of Helsinki.
- Blockey, P.N., & Hartley, L.R. (1995). Aberrant driving behaviour: errors and violations. *Ergonomics*, 38, 1759-1771.
- Burgess, C., & Webley, P. (2000). Evaluating the effectiveness of the United Kingdom's National Driver Improvement Scheme. School of Psychology, University of Exeter.
- Davey, J., Wishart, D., Freeman, J, & Watson, B. (in press). An application of the Driver Behaviour Questionnaire in an Australian organisational fleet setting. *Transportation Research Part F*.
- Deffenbacher, J.L., Oetting, E.R., & Lynch, R.S. (1994). Development of a driving anger scale. *Psychological Reports*, 74, 83-91.
- Diaz, R.L., Cabrera, D.D. (1997). Safety climate and attitude as evaluation measures of organizational safety. *Accident Analysis and Prevention*, 29, 643-650.
- Dimmer, A.R., & Parker, D. (1999). The accident, attitudes and behaviour of company car drivers. In G.B. (Ed.), Behavioural Research in Road Safety XI. Crowthorne, Berkshire: Transport Research Laboratory.
- Dobson, A., Brown, W., Ball, J., Powers, J., & McFadden, M. (1999). Women drivers' behaviour, socio-demographic characteristics and accidents. *Accident Analysis and Prevention,* 31, 525-535.
- Donoho, R. (1996). Gearing up for driver safety. Sales and Marketing Management, 148, 66-67.

- Downs, C. G., Keigan, M., Maycock, G., & Grayson, G. B. (1999). *The safety of fleet car drivers: A review* (No. 390). Crowthorne: Transport Research Laboratory.
- Harrison, J.E., Mandryk, J.A., & Frommer, M.S. (1993). Work-related road fatalities in Australia, 1982-1984. Accident Analysis and Prevention, 25, 443-451.
- Gillen, M., Baltz, D., Gassle, M., Kirsch, L., & Vaccaro, D. (2002). Perceived safety climate, job demands, and coworker support among union and non-union injured construction workers. *Journal of Safety Research*, 33, 33-51.
- Glendon, A.I., & Litherland, D.K. (2001). Safety Climate factors, group differences, and safety behaviour in road construction. *Safety Science*, *39*, 157-188.
- Glendon, A.I., & Stanton, N.A. (2000). Perspectives on safety culture. Safety Science, 34, 193-214.
- Haworth, N. (2002). Fleet safety lessons from around the world. Paper presented at the Symposium on Work-Related Road Trauma and Fleet Risk Management in Australia, Canberra.
- Haworth, N., Tingvall, C., & Kowadlo, N. (2000). Review of best practice road safety initiatives in the corporate and/or business environment (No. 166). Clayton: Monash University Accident Research Centre.
- Lajunen, T., & Summala, H. (1997). Effects of driving experience, personality, and driver's skill and safety orientation on speed regulation and accidents. In T. Rothengatter & E. Carbonell Vaya (Eds.), Traffic and transport psychology: Theory and application (pp. 283–294). Amsterdam: Pergamon.
- Lawton, R., Parker, D., Stradling, S., & Manstead, A. (1997). The role of affect in predicting social behaviours: the vase of road traffic violations. *Journal of Applied Social Psychology*, 27, 1258 1276.
- Lynn, P., & Lockwood, C.R. (1998). *The accident liability of company car drivers. Report No. 317*. Crowthorne, Berkshire: Transport Research Laboratory.
- Meadows, M. (2002). Speed Awareness Training. *Paper presented at the 67th Road Safety Congress*, 4th 6th March, Stratford, UK.
- Mearns, K., Flin, R., Gordon, R., & Fleming, M. (1998). Measuring safety climate on offshore installation. *Work and Stress, 12,* 238-254.
- Mearns, K., Whitaker, S.M., & Flin, R. (2003). Safety climate, safety management practice and safety performance in offshore environments. *Safety Science*, 41, 641-680.
- Meers, G. (2001). Queensland crash data on work-related crashes and injuries. Symposium conducted at the *Work-related Road Trauma and Fleet Risk Management in Australia*, Brisbane, Australia.
- Moser, P. (2001). Rewards for creating a fleet safety culture. *Professional Safety*, 46(8), 39-41.
- National Occupational Health and Safety Commission. (1998). Worl-related traumatic fatalities in Australia, 1989-1992. Sydney: National Occupational Health and Safety Commission.
- Newnam, S., Watson, B., Murray, W. (2002). A comparison of the factors influencing work-related drivers in a work and personal vehicle. *In the Proceedings of the Road Safety Policy, Education and Policing Conference*, Adelaide, Australia.

- Newnam, S., Watson, B., Murray, W. (2004). Factors predicting intentions to speed in a work and personal vehicle. *Transportation Research Part F*, *7*, 287-300.
- Parker, D., Stradling, S.G., & Manstead, A. (1996). Modifying beliefs and attitudes to exceeding the speed limit: An intervention study based on the theory of planned behaviour. *Journal of Applied Social Psychology*, 26, 1-19.
- Reason, J., Manstead, A., Stradling, S., Baxter, J., & Campbell, K. (1990). Errors and violations: a real distinction? *Ergonomics*, *33*, 1315-1332.
- Stewart-Bogle, J.C. (1999). Road Safety in the Workplace: the likely savings of a more extensive road safety training campaign for employees. Symposium conducted at the Insurance Commission of Western Australia Conference on Road Safety "Green Light for the Future", WA, Australia.
- Stradling, S.G. (2000). Driving as part of your work may damage your health. In G.B. Grayson (Ed.), Behavioural Research in Road Safety IX pp. 1-9. Crowthorne, Birkshire: Transport Research Laboratory.
- Sullman, M.J., Meadows, M., & Pajo, K.B. (2002). Aberrant driving behaviours amongst New Zealand truck drivers. *Transportation Research Part F*, 5, 217-232.
- Wheatley K. (1997) An overview of issues in work-related driving. In Staysafe 36: Drivers as workers, vehicles as workplaces: Issues in fleet management. (Report No. 9/51). *Ninth report of the Joint Standing Committee on Road Safety of the 51st Parliament*. Sydney: Parliament of New SouthWales.
- Wills, A.R. (2006). An Exploration into Safety Climate and Culture, Occupational Stress, and Job Performance. PhD Confirmation Report. CARRS-Q: Queensland University of Technology.
- Wills, A.R., Biggs, H.C., & Watson, B. (2006). Road safety in corporate fleet settings: Approaches from organisational and industrial psychology. *Paper presented at the Australasian Road Safety Research, Education and Policing Conference*, Wellington, New Zealand, 14-16 November.
- Wills, A.R., Watson, B., & Biggs, H.C. (in press). Comparing Safety Climate Factors as Predictors of Work-Related Driving Behavior. *Journal of Safety Research*.
- Xie, C., & Parker, D. (2002). A social psychological approach to driving violations in two Chinese cities. *Transportation Research Part F*, *5*, 293-308.