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The Influence of Driver Pressure on Road Safety Attitudes and Behaviours: A Profile of Taxi Drivers

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Abstract

While recent years have seen a growing body of work-related road safety research from a behavioural perspective, scant research concerning taxi drivers has been reported. Currently there is little gathered evidence regarding taxi driver’s attitudes and road safety perceptions and research has yet to examine the extent of this group’s engagement in aberrant driving behaviours. This study reports on the development of a Driver Perception of Pressure Questionnaire and the utilisation of abbreviated versions of the Manchester Driver Behaviour Questionnaire (DBQ) and Driver Attitude Questionnaire (DAQ) to provide a profile of the potential effects of driver pressure, self-reported attitudes and corresponding driving behaviours of a sample of taxi drivers (N = 182). Questionnaires were individually distributed to participants at a taxi company depot as well as taxi ranks both during day and night shifts. A series of univariate and bivariate analyses were undertaken to identify relationships between the questionnaires as well as the demographic data. Univariate analyses identified that taxi drivers were more likely to report engaging in aggressive driving acts than speeding violations, and believed speeding was more acceptable compared to drink driving, following too closely or engaging in risky overtaking manoeuvres. Bivariate analyses indicated that individuals who reported a greater perception of pressure were more likely to engage in a higher level of aberrant driving behaviours (e.g., aggression & speeding) and also report less safe driving attitudes. Examination of factors related with demerit point loss revealed that the only two factors significantly associated with receiving fines were: i) taxi drivers with a greater perception of negative type pressure and ii) risky driving practices (i.e. overtaking). In contrast to previous research road exposure did not significantly influence taxi-related crash and traffic offence involvement in this sample. Taken together, the results indicate that some taxi drivers do have a significant perception of driver pressure and willingly admit to engaging in unsafe driving practices and thus road safety benefits may result from developing and implementing targeted interventions designed to improve work-related driving among this group. This paper will further outline the major findings of the study as well as highlight possible research avenues to improve both current knowledge and taxi operating practices.

Résumé

Alors que les dernières années ont vues un net accroissement des études comportementales en sécurité routière dans le monde professionnel, la recherche concernant les chauffeurs de taxi a été nettement insuffisante. À l’heure actuelle il existe peu de données concernant l’attitude des chauffeurs de taxi et leur perception de la sécurité routière et la recherche doit encore se
pencher sur l’ampleur de l’engagement de ce groupe dans des comportements anormaux au volant. Cette étude concerne le développement d’un Questionnaire de Perception de la Pression par le Conducteur et l’utilisation de versions abrégées des Questionnaire de Comportement du Conducteur de Manchester et Questionnaire d’Attitude du Conducteur pour construire un profil des effets potentiels de la pression, des attitudes auto-rapportées et des comportement de conduites correspondants d’un échantillon de chauffeurs de taxi (N = 182). Les questionnaires ont été distribués individuellement aux participants aux dépôts des sociétés de taxi ainsi que dans les stations de taxi pour les services de jour comme de nuit. Une série d’analyses mono et bi-variables a été effectuée afin d’identifier les liens entre les questionnaires ainsi que les données démographiques. Les analyses mono-variables ont identifiées que les chauffeurs de taxi étaient plus à même de rapporter des comportements de conduite agressive plutôt que des excès de vitesse et qu’ils pensent que les excès de vitesse sont plus acceptable que la conduite en état d’ivresse, suivre de trop prêt le véhicule précédent ou s’engager dans des dépassements risqués. Les analyses bi-variables indiquent que les individus les plus conscients de la pression étaient plus à même de s’engager dans des comportements anormaux (agressivité, excès de vitesse…) et de rapporter des attitudes de conduite moins sécurisées. Un examen des facteurs associés à la perte de points du permis de conduire a révélé que les deux seuls facteurs significatifs associés à la réception d’amendes sont : i) les chauffeurs de taxi avec une perception de la pression négative plus grande et ii) les pratiques de conduite risquées (dépassements par exemple). Au contraire de précédentes études, l’exposition routière n’a pas influencé significativement les accidents et infractions au code de la route associés aux taxis. Pris dans leur globalité ces résultats montrent que certains chauffeurs de taxi ont une perception significative de la pression, admettant volontiers adopter des pratiques dangereuses et que développer et implémenter des stratégies ciblées pour améliorer la conduite professionnelle au sein de ce groupe pourrait avoir des avantages pour la sécurité routière. Cet article développe plus précisément les conclusions principales de l’étude et souligne également de possibles ouvertures pour améliorer à la fois la connaissance actuelle de ce sujet et les pratiques opérationnelles des taxis.

INTRODUCTION

Present Fleet Safety Context

There is a growing body of evidence within Australia and overseas confirming the overall impact that fleet related safety issues have on business effectiveness and road safety [1,2]. Recently, many jurisdictions have moved to clarify a vehicle used for the purpose of work as a “workplace” under Workplace Health and Safety (WHS) legislation [3]. Therefore, organisations are required to include work-related driving within their organisational WHS regulation compliance. Work-related motor vehicle incidents represent a substantial emotional and financial cost to the community. In Australia, road crashes are the most common cause of work-related fatalities, injuries and absence from work [2], with the average time lost being greater than any other workplace claim [4]. Further research has shown that work-related traffic injuries are about twice as likely to result in death or permanent disability than other workplace accidents [5] and account for up to 49% of work related fatalities in Australia, when commuting to and from work (26%) is taken into account [6], and 13% of the national road toll [7].
Previous research estimated that the total cost of work related road incidents in Australia is in the vicinity of $1.5 billion [5]. More recent evidence has suggested that the average total insurance cost of a fleet incident to organisations and society is approximately $28,000 [8], while the average cost of a fatal crash in the general Australian motoring community is estimated to be $2 million [9]. Furthermore, estimates of the true cost for work related crashes suggest that hidden costs may be somewhere between 8-36 times vehicle repair/replacement costs [7]. These hidden costs include items such as, workers compensation, medical costs associated with injury to staff, injury rehabilitation, injury to third party, third party property loss, loss of productivity due to days off work, loss of position and staff backfill costs as a result of absence from work, legal costs associated with workers compensation and third party claims, increased risk, insurance premiums and potential loss of customers. 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.

**Taxi Road Safety Context**

Research based on taxi driver road safety is scarce, particularly in Australia. A briefing paper reporting statistics relating to workplace safety and public safety issues associated with the taxi industry revealed potentially alarming taxi crash rates [10]. Based on Motor Accident Authority data for the state of NSW in 1994 taxi’s accounted for 0.2% of all registered vehicles, 1.9% of the vehicles involved in crashes and were involved in 3.2% of all reported crashes [10]. In addition, based on RTA data for 1994 taxis were involved in 5 fatalities, 122 serious injury crashes and 1107 non injury crashes where a vehicle had to be towed away [10]. Compared to the NSW vehicle fleet as a whole the crash rate varied. Furthermore, in the Staysafe 36 [10], taxis were approximately 16 times more likely to be involved in a tow away crash and were approximately 4.5 times more likely to be involved in a fatality than other vehicles on register. Taxi drivers were somewhere between 1 and 2 times more likely to be involved in a fatality than other drivers. Based on such data it would appear that taxis are over represented in road crashes. However, when the number of kilometres the average taxi does in relation to a private vehicle is considered then the interpretation is rather different. In fact in terms of fatalities per 100 million vehicle kilometres taxis are about half as likely to be involved as the general driving population.

Previous research conducted with 165 taxi drivers in Sydney, Australia identified a number of influences relating to risk-taking and increased crash rates. The research identified that taxi drivers often work shifts more than 10-12 hours and consequently due to this increased shift length is considered a fatigue related variable [11]. The study also suggested that as a shift extends beyond 11-12 hours, even by only small amounts, crash risk rises considerably [11]. In addition, aggression/expressed anger, sensation seeking and economic pressure are related to increased levels of risk-taking and crash rates [11]. This is accentuated by the fact that taxi drivers work long hours (50+ hours average per week) but do not seem to earn high incomes.

**Effect of Pressure (Stress) on Driver Safety**

Pressure, such as situational and task demands impact negatively on driver safety. When driving for the purpose of work, drivers are likely to experience additional sources of stress such as
those associated with their job, i.e. occupational stress [12]. For example, research suggests that factors such as time pressures, thinking about work, and lack of concentration are risk factors for work-related drivers [1,13]. Such sources may also impact on driver safety if, for example, workers feel as though they need to commit traffic offences such as speeding or close following in order to meet task demands such as making scheduled appointments on time [12].

Research has identified a number of stressors namely “driving environment”, “work”, “relationships” and “societal expectations” that all in some way may have an impact on the occupational driver, thereby, increasing stress levels and for some individuals leading to adverse behaviours and events [12]. For example, aggressive behaviour, fatigue, inattention/distraction, and depression/anxiety (including alcohol/drug abuse, etc) have been significantly researched and documented as contributing factors of road accidents and fatalities [12]. However, in some instances, it is believed that reactions to stress may indeed lead to the highlighted contributing factors, especially in work-related driving. For example, unreasonable job quotas combined with slow traffic conditions may increase stress, which in turn may increase the potential for aggressive and erratic driving. In addition, driver stress has been related to aggressive driving [14], poor concentration levels [15], and accidents [16]. After effects of negative moods, thoughts, or attitudes to work and family environments have been also found to aggravate driving stress [14]. The danger of driver aggression is evident through its relationship with increased incident/crash involvement, a danger not only for the driver but for surrounding motorists as well [17]. This paper also aims to assess the specific “on the job” issues relating to pressure or driver stress which may influence taxi driver behaviours and attitude, and ultimately their safety, the safety of customers and members of the public.

Self-Report Driving Measurement Tools

As a result of the tremendous financial and personal impact of road crashes, an increasing amount of attention is being focused on determining the link between motorists’ self-reported driving behaviours and attitudes and their subsequent involvement in crashes and traffic offences. While a number of measurement tools have recently been developed to examine individuals’ driving behaviours, the Manchester Driver Behaviour Questionnaire (DBQ) [18], and Driver Attitude Questionnaire (DAQ) [19] remain the predominant tools to assess general motorists’ driving attitudes and outcomes.

Firstly, in regards to the DBQ, the measurement tool has been extensively utilised within a range of driver safety research areas such as: the genetics of driving behaviour [20], age differences in driving behaviour [21], cross cultural studies [22] and associations with the likelihood of being involved in an accident [18,21,23]. 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 [23].

Secondly, another driving tool which is beginning to receive increasing attention within the road safety literature is the Driver Attitude Questionnaire [19]. Research has begun to utilise the DAQ within a number of different applied settings such as: speed awareness training [24], general driver training programs [25], bicycle interventions [26], as well as fleet programs [27]. 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 report the most lenient attitudes towards speeding violations [24,27].

Thirdly, the Driver Perception of Pressure (DPP) questionnaire, developed for this study, is a measure to determine the degree by which taxi driver’s believe or perceive they are under pressure or pushed to engage in aberrant driving behaviours. This questionnaire was developed after a review of previous research literature [11] and communication with taxi organisation management and drivers to identify what factors they perceived that influenced their ability to drive safely. Pressure placed on drivers from both internal and external influences was a common theme identified from the communication and consultation.

However, despite the considerable exposure on public roads, relatively little research has endeavoured to examine the self-reported driving behaviours and attitude of taxi drivers. In addition, little research could be found that examines the influence of taxi driver behaviours and the subsequent effect on crash and traffic offence involvement. As a result, the study aimed to:

a) examine a group of taxi drivers’ perception of pressure, attitudes and behaviours regarding road safety issues via three measurement tools (i.e., DBQ, DAQ & DPP); and
b) investigate the relationship that the measurement tools have with self-reported crash involvement and demerit point loss.

METHOD

Participants

A total of 182 individuals volunteered to participate in the study and were all taxi drivers from a north Queensland region in Australia. There were 151 males (83%) and 31 females (13%). The higher proportion of males in the sample reflects the nature of the occupation where the majority of drivers have traditionally been males. The average age of the sample was 50yrs, with taxi drivers who responded to the survey having an age range from 21 to 72 years of age. The largest proportion of taxi drivers ‘work/drive for an owner’ (48%), with a further 25% of drivers that ‘hire’ the taxi, 19% are ‘owner’ drivers, and 8% that ‘lease’ the taxi. Taxi shifts driven by participants were reported to be day shift (46%), night shift (38%), ‘the same of each’ (10%) and ‘changes each week’ (6%). On average participants had held their licence for 28 years (range 1 – 54yrs), had been driving a taxi for approximately 8 years (range 0.1 – 37yrs), with an average taxi driving exposure of approximately 53 hours per week, and 1189 kilometres per week. A total of 38 participants reported being involved in a crash while driving taxis in the last year while 52 individuals reported incurring traffic infringements/fines (i.e., demerit point loss) during the same time period.

Materials

Due to the nature of work for most taxi drivers, time for completing a survey is restricted to breaks between obtaining fares. Therefore, to encourage taxi drivers to participate in the survey and ensure completion rates, various survey questionnaires were reduced in length to reduce
the time required to complete the survey. Factor analytic procedures combined with an examination of alpha coefficients were implemented to develop abbreviated assessment tools.

An abbreviated version of the DBQ used by Davey et al. [27] was utilised in the research project. The DBQ utilised previously by Davey et al. [27] was a modified version of the original DBQ developed by Reason et al. [18], changed in order to make the questionnaire more representative of Australian work-related driving conditions. Respondents were required to indicate on a seven point likert scale (1 = never to 7 = always) how often they commit each of the errors (4 items), highway-code violations (4 items) and aggressive violations (2 items).

The abbreviated DAQ is a 12-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 seven point likert scale (1 = strongly disagree to 7 = strongly agree) their agreement with statements regarding the appropriateness of various driving behaviours.

Developed for this study, the Driver Perception of Pressure (DPP) questionnaire is a measure to determine the degree by which taxi driver’s believe or perceive they are under pressure or pushed to engage in aberrant driving behaviours. Respondents are required to indicate on a seven point likert scale (1 = Never to 7 = Always) their perception of pressure when driving taxis for work.

A number of socio-demographic questions were also 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., kilometres, driving hours).

Procedure

The researcher assisted in the distribution and collection of survey questionnaires over a three day period. Participants (taxi drivers) were asked to travel to the local Taxi Depot if they would like to complete the survey questionnaire. This was done on a gradual basis over two full day shifts so not to disrupt service to clients. The researcher also approached taxi drivers at various taxi ranks during both day and night shifts, for example, the local airport, city centre, casino and night club areas. Participants that could not complete the survey due to receiving a fare were given a pre-paid envelope and requested to post the survey once completed. Ten pre-paid envelopes were provided to drivers and all ten were returned. A total of 184 surveys were collected and of these 182 surveys were usable, two were discarded due to insufficient completed content for analysis. In total there are 480 licensed taxi drivers in the survey region indicating a response rate of 38%.

RESULTS

Reliability and Structure of the DBQ and DAQ Questionnaires
The internal consistency of the abbreviated forms of the DBQ and DAQ were examined through calculating Cronbach’s alpha reliability coefficients, which are presented in Table 1. Similar to previous Australian research [21,28], and on professional drivers [29], the DBQ factors 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 [24,27].

<table>
<thead>
<tr>
<th>Questionnaire Subscales</th>
<th>Items</th>
<th>Reliability</th>
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</thead>
<tbody>
<tr>
<td><strong>Abbreviated DBQ</strong></td>
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<td></td>
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<tr>
<td>Highway-code violations</td>
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<td>.84</td>
</tr>
<tr>
<td>Errors</td>
<td>(4 items)</td>
<td>.74</td>
</tr>
<tr>
<td>Aggressive violations</td>
<td>(2 items)</td>
<td>.70</td>
</tr>
<tr>
<td><strong>Abbreviated DAQ</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td>(3 items)</td>
<td>.57</td>
</tr>
<tr>
<td>Close Following</td>
<td>(3 items)</td>
<td>.67</td>
</tr>
<tr>
<td>Overtaking</td>
<td>(3 items)</td>
<td>.74</td>
</tr>
<tr>
<td>Speeding</td>
<td>(3 items)</td>
<td>.70</td>
</tr>
</tbody>
</table>

Table 1 – Alpha reliability coefficients of the DBQ and DAQ questionnaires

Table 2 reports the overall mean scores for the factors within the DBQ and DAQ scales. A higher mean for the DAQ reveals a more appropriate attitude towards the road safety factors, whereas a higher mean for the DBQ represents more active engagement in aberrant driving behaviours in the last 6 months. Examination of the mean scores indicates that of the four DAQ driving behaviours, participants were most likely to report that drink driving was generally an unacceptable behaviour in most circumstances ($M = 6.40$). The second highest factor was overtaking, followed by attitudes regarding close following. In contrast, participants were most likely to report that speeding was an acceptable behaviour ($M = 4.39$). Between group analyses demonstrated that participants’ attitudes towards the unacceptability of drink driving were significantly higher than risky overtaking practices $F(1, 181) = 26.22, p = .000$, close following $F(1, 181) = 44.82, p = .000$ and especially speeding $F(1, 181) = 257.78, p = .000$. The results indicate that drink driving is perceived as the most serious offence in the current sample, and similar to previous research [25,27], speeding is often perceived as an acceptable behaviour in some circumstances.

Between-group analyses identified few meaningful differences within the DBQ scales and as highlighted in Table 2, means were similar for the DBQ. In addition, Table 2 reports the mean and standard deviation scores for the four less safe ranked items for each of the DBQ and DAQ measurement tools. It is noteworthy that these items also generally relate to speeding behaviours.
### Table 2 – Mean scores for DBQ and DAQ questionnaire factors

#### Structure and Reliability of the DPP Questionnaire

As the Driver Perception of Pressure Questionnaire was developed especially for this study and not used previously in other research, a factor analysis was conducted to determine if the questionnaire variables could be further developed into separate subscales, see Table 3. Factor analysis was administered on the 14 item questionnaire. Principal components analysis with oblique rotation was implemented to determine the factor structure of the DPP, which revealed a two-factor solution that accounted for 60% of the total variance. The first factor accounted for approximately 43% of the total variance and contained 10 items relating to more negative type pressures that influence taxi driving safety. Items relating to pressure from internal and external influences as well as pressure from traffic congestion were identified as the strongest contributors to the factor (e.g., Pressure from taxi company pushes me to rush traffic lights, Pressure to increase income means I rush traffic lights, Congested roads push me to rush traffic lights and signs, etc.).
The second factor accounted for 17% of the total variance and contained 4 items relating to more positive type pressures. The 4 items contained in the second factor relate to positive influences to drive safely, such as encouragement to drive safely and police enforcement issues (e.g., Police enforcement pressures me to obey speed limit, Pressure to drive safely is encouragement to keep to speed limit, etc).

<table>
<thead>
<tr>
<th>Description</th>
<th>F1</th>
<th>F2</th>
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<tbody>
<tr>
<td>Pressure from taxi company pushes me to rush traffic lights</td>
<td>.82</td>
<td></td>
</tr>
<tr>
<td>Pressure to increase income means I rush traffic lights</td>
<td>.81</td>
<td></td>
</tr>
<tr>
<td>Congested roads push me to rush traffic lights and signs</td>
<td>.79</td>
<td></td>
</tr>
<tr>
<td>Pressure to increase income means I speed or tailgate</td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>Congested roads push me to tailgate</td>
<td>.77</td>
<td></td>
</tr>
<tr>
<td>Need to pay bills pressures me not to stop and rush traffic lights</td>
<td>.76</td>
<td></td>
</tr>
<tr>
<td>Low shift earnings push me to drive tired</td>
<td>.73</td>
<td></td>
</tr>
<tr>
<td>Passenger offers large tip I feel pressure to tailgate or speed</td>
<td>.73</td>
<td></td>
</tr>
<tr>
<td>If passenger has deadline I feel pressure to speed or tailgate</td>
<td>.71</td>
<td></td>
</tr>
<tr>
<td>Pressure from taxi company pushes me to speed or tailgate</td>
<td>.69</td>
<td></td>
</tr>
<tr>
<td>Police enforcement pressures me to obey speed limit</td>
<td></td>
<td>.80</td>
</tr>
<tr>
<td>Police enforcement pressures me to obey traffic lights and stop signs</td>
<td></td>
<td>.79</td>
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<tr>
<td>Pressure to drive safely is encouragement to obey traffic lights &amp; signs</td>
<td></td>
<td>.62</td>
</tr>
</tbody>
</table>

Table 3 - Factor structure of the DPP

Cronbach’s Alpha reliability coefficients for the two sub-factors in the DPP scale were quite robust. This was especially evident in relation to the Negative Pressure scale which had a Cronbach’s Alpha reliability coefficient of $\alpha = .91$, indicating that the items are highly consistent in their measurement ability to assess driver negative pressure propensity for this sample. Examination of the Alpha Coefficient for the Positive Pressure subscale revealed an adequate reliability of $\alpha = .75$.

Table 4 reports the overall mean scores for the factors within the DPP scale. A lower mean for the DPP-Negative factor reveals a more safe perception of pressure, whereas a higher mean for the DPP-Positive represents a more safe perception of positive-type pressure. Both factors indicate that taxi drivers’ perception of pressure may influence their ability to drive safely. In addition, Table 4 reports the mean and standard deviation scores for the four less safe ranked items for the DPP measurement tools.
Description | M | SD
--- | --- | ---
**DPP**
DPP-Negative | 2.58 | 1.32
DPP-Positive | 3.46 | 1.56

Less Safe Ranked Items
1. Low shift earnings push me to drive even when tired | 3.22 | 2.10
2. If the passenger has a tight deadline I feel pressured to tailgate and/or speed | 3.13 | 1.95
3. Pressure from taxi companies to quickly pick up waiting passengers pushes me to speed, or tailgate | 2.81 | 1.78
4. If the passenger offers me a large tip to get to a destination quickly I feel pressured to tailgate and/or speed | 2.61 | 1.91

### Table 4 – Mean scores for DPP questionnaire factors

#### Intercorrelations Between Variables

An examination was undertaken to determine the bivariate relationships between the DPP, DBQ, DAQ factors as well as socio-demographic variables. As expected, strong relationships appeared evident between the DAQ factors, with the highest correlation being between close following and risky overtaking ($r = .70^{**}$). 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 bivariate relationship identified between highway-code violations and errors ($r = .66^{**}$). For example, those who engaged in highway-code violations (i.e., speeding) were also more likely to commit errors while driving. An equally significant bivariate relationship was identified between highway-code and aggressive violations ($r = .65^{**}$). For example, those who engaged in highway-code violations (i.e., speeding) were also more likely to exhibit aggressive acts while driving.

In regards to bivariate relationships between the questionnaires, significant negative correlations were evident between all the DBQ and DAQ sub-factors (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., $r = -.42^{**}$). Positive correlations were identified between the DBQ and DPP factors, as the perception of negative-type pressure increases so does the levels of self-reported aberrant driving behaviour. For example, the DPP-Negative was positively correlated with driving errors ($r = .49^{**}$), highway violations ($r = .68^{**}$) and aggressive violations ($r = .40^{**}$). In regards to the association between DAQ and DPP factors, correlations were evident between questionnaires with the strongest relationships being between the DPP-Negative and the DAQ factors, overtaking ($r = -.51^{**}$) and close following ($r = -.51^{**}$). Weaker correlations were identified between the DPP-Negative factor and speeding ($r = -.41^{**}$) and alcohol ($r = -.19^{**}$). In contrast to previous research [27] no significant relationship was identified between the sample characteristics (e.g. age, driving...
experience, road exposure, etc) and the DAQ and DBQ questionnaire factors. However, a weak significant negative relationship was identified between the DPP-Negative factor and ‘years driving taxis’ ($r = -.26^{**}$), suggesting those drivers with less taxi driving experience have a greater perception of pressure compared to drivers that have more taxi driving experience.

Interestingly, no significant relationships were identified between the DBQ, DAQ and DPP scale factors and self-reported crashes. However, significant positive relationships were identified between self-reported demerit point loss (traffic infringements) while driving taxis and both the DBQ highway-code violations ($r = .20^{**}$) and DPP-Negative factors ($r = .30^{**}$). For example, those taxi drivers engaged in highway-code violations (i.e., speeding) were also more likely to incur demerit point loss. Likewise, those taxi drivers who had a greater perception of pressure were also more likely to incur demerit point loss.

While the DPP-Negative subscale was statistically correlated to both the DBQ and DAQ subscales, the DPP-Positive subscale was not correlated to any of the major questionnaire factors. This result indicates that the DPP-Positive subscale does not significantly influence driver safety attitudes or behaviours for this sample of taxi drivers.

**Prediction of Work-Related Crashes and Demerit Point Loss**

The second part of the study aimed to examine the relationship between participants’ driving attitudes, behaviours and perception of pressure as measured by the DAQ, DBQ, DPP and self-reported work crashes and infringements (demerit point loss). Due to the relatively small number of participants who reported a work-related crash in the last 12 months ($N = 38$), the implementation of multivariate models of prediction (e.g., logistic regression) were not undertaken due to the small sample size. However, a total of 52 participants reported incurring demerit point loss while driving taxis 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), DPP factors (DPP-Negative and DPP-Positive) as well as exposure to driving (e.g., kilometres driven each week) to the prediction of self-reported demerit point loss in the past 12 months. It is noted that the analysis outcomes are likely to be influenced by the limited power (e.g., sample size) and this should be borne in mind when interpreting the results.

Table 5 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 week was 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. Surprisingly, exposure to the road (i.e., kilometres per week) did not significantly influence driver behaviours and crash or demerit point loss in this sample of taxi drivers, although it is noted this may stem from the small sample size.

Next, the DBQ, DAQ and DPP factors were entered in the model to assess whether the proposed perception of pressure, attitudes and behaviours indicated a prediction of demerit point loss. The additional variables collectively were significant, with a chi-square statistic of $X^2 (9, N = 182) = 21.41$, $p = .011$. The model indicates that participants who reported a higher incidence of risky driving practices (i.e., overtaking) were most likely to incur work-related demerit point loss ($p = .007$). Furthermore, reporting a higher perception of driving pressure was also
predictive of demerit point loss ($p = .015$). Several additional regression models were estimated to determine the sensitivity of the results. A test of the full model with all variables entered together confirmed the same significant predictors. Additionally, the inclusion of gender, age, shift times and length of breaks did not increase the predictive value of the model.

<table>
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<td>1.00 1.00</td>
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<td>.35</td>
<td>3.38</td>
<td>.066</td>
<td>.52  .26 1.04</td>
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<td>.33</td>
<td>.57</td>
<td>.449</td>
<td>1.28 .67 2.46</td>
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<tr>
<td>Aggressive</td>
<td>.39</td>
<td>.21</td>
<td>3.38</td>
<td>.066</td>
<td>1.48 .97 2.26</td>
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<tr>
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<td>.20</td>
<td>.00</td>
<td>.986</td>
<td>.99  .66 1.49</td>
</tr>
<tr>
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<td>.05</td>
<td>.22</td>
<td>.06</td>
<td>.796</td>
<td>1.05 .68 1.64</td>
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<tr>
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<td>.14</td>
<td>1.58</td>
<td>.208</td>
<td>.83  .62 1.10</td>
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<tr>
<td>Overtaking</td>
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<td>.27</td>
<td>7.26</td>
<td>.007</td>
<td>2.09 1.22 3.59</td>
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<td>.19</td>
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<td>.16</td>
<td>.682</td>
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Note. * p<.05, **p <.01. CI = Confidence level

Table 5 – Logistic Regression

DISCUSSION

The present paper aimed to report on the utilisation of a range of self-report driving measurement tools (e.g., DAQ, DBQ & DPP) to conduct an investigation into the driving behaviours, attitudes and perception of pressure of a group of Australian taxi drivers. In addition, the research aimed to investigate whether taxi drivers' behaviours, attitudes and pressure regarding road safety issues were associated with crash and/or traffic offence involvement. Presently, only a small body of research has examined the self-reported driving attitudes and behaviours of work-related drivers [27,29,30], with less research focusing on the driving conduct of taxi drivers 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 DPP were moderately robust, with the results similar to previous research that has utilised the questionnaires [21,28,29]. In contrast, to previous research [27] the abbreviated DAQ’s internal consistency for the overtaking and speeding factors was
moderately robust. However, the internal consistency for the alcohol and close following factors remains relatively low. Further research is necessary to determine the psychometric properties of the abbreviated questionnaire, and its subsequent usefulness within work-related driving research arenas.

Secondly, examination of the mean scores for the DBQ, DAQ and DPP factors revealed that participants generally reported positive attitudes and behaviours towards road safety. In regards to attitudes, similar to previous research [24,27], respondents reported drink driving as the most serious driving behaviour. Participants also reported risky overtaking and close following 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 [22,23,30]. As a result, it appears taxi drivers core risky driving behaviours are similar to that of other fleet drivers e.g., speeding. In addition, taxi drivers reported that pressures (specifically negative type pressures) placed upon them by the organisation, customers and other external factors influenced their ability to drive safely. This result supports previous research that suggested economic pressure is related to increased levels of risk-taking and crash rates [11].

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 bivariate correlations also provided a preliminary indication that driver perception of pressure, in particular negative type pressure, is associated with driving behaviours. For example, the collected data generally indicates that taxi drivers with a greater perception of pressure are more likely to partake in aberrant and risky driving behaviours. While only preliminary, the results indicate that taxi drivers’ “perception of pressure” has the potential to directly impact upon the driving outcomes exhibited by employees.

Within this study, 38 participants reported being involved in a crash and 52 participants reported incurring a traffic offence while driving taxis in the past 12 months. In regards to the prediction of self-reported demerit point loss while driving taxis for work, a number of key factors were identified. Surprisingly, exposure to the road (i.e. kilometres per week and hours driving taxis per week) did not significantly influence driver behaviours and crash or demerit point loss in this sample of taxi drivers, although it is noted this may stem from the small sample size. In addition, the logistic regression analyses indicated that increased risky driving practices (e.g., overtaking) as well as a higher perception of negative-type pressure were both predictors of demerit point loss. This data provides an opportunity for taxi company management to identify at risk drivers and initialise interventions aimed at proactively addressing drivers’ attitude and behaviour.

Limitations

A number of limitations should be taken into account when interpreting the results of this study. The response rate of participants was low and questions remain regarding the reliability of the self-reported attitudes e.g., self-report bias. Questions remain about the representativeness of the sample as the participant pool was drawn from one regional area and such driving styles may not be easily transferable to other taxi driving populations in metropolitan areas. In
summary, further research is required to establish the reliability and validity of the scales for the Australian taxi setting and the usefulness of the tool in informing road safety interventions for taxi drivers.

Nonetheless, the results may prove to have direct implications for taxi operational interventions, not only through supervising and monitoring the driving performance of drivers, but also through proactive measures to reduce the risk to drivers and supporting positive driver attitude and behaviours. Importantly, this process is aimed at reducing the likelihood of a work-related crash/offence before the event occurs, rather than by the traditional post hoc analysis of fleet incident databases [30].

REFERENCES


