TITLE

“I drove after drinking alcohol” and other risky driving behaviours reported by young novice drivers in Queensland, Australia

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Abstract

Background. Volitional risky driving behaviours such as drink- and drug-driving (i.e. substance-impaired driving) and speeding contribute to the overrepresentation of young novice drivers in road crash fatalities, and crash risk is greatest during the first year of independent driving in particular.

Aims. To explore the: 1) self-reported compliance of drivers with road rules regarding substance-impaired driving and other risky driving behaviours (e.g., speeding, driving while tired), one year after progression from a Learner to a Provisional (intermediate) licence; and 2) interrelationships between substance-impaired driving and other risky driving behaviours (e.g., crashes, offences, and Police avoidance).

Methods. Drivers ($n = 1,076$; 319 males) aged 18-20 years were surveyed regarding their sociodemographics (age, gender) and self-reported driving behaviours including crashes, offences, Police avoidance, and driving intentions.

Results. A relatively small proportion of participants reported driving after taking drugs (6.3% of males, 1.3% of females) and drinking alcohol (18.5% of males, 11.8% of females).

In comparison, a considerable proportion of participants reported at least occasionally exceeding speed limits (86.7% of novices), and risky behaviours like driving when tired (83.6% of novices). Substance-impaired driving was associated with avoiding Police, speeding, risky driving intentions, and self-reported crashes and offences. Forty-three percent of respondents who drove after taking drugs also reported alcohol-impaired driving.

Discussion and Conclusions. Behaviours of concern include drink driving, speeding, novice driving errors such as misjudging the speed of oncoming vehicles, violations of graduated driver licensing passenger restrictions, driving tired, driving faster if in a bad mood, and active punishment avoidance. Given the interrelationships between the risky driving behaviours, a deeper understanding of influential factors is required to inform targeted and general countermeasure implementation and evaluation during this critical driving period. Notwithstanding this, a combination of enforcement, education, and engineering efforts appear necessary to improve the road safety of the young novice driver, and for the drink-driving young novice driver in particular.

“I drove after drinking alcohol” and other risky driving behaviours reported by young novice drivers

Introduction

Young novice drivers aged 17-25 years who hold an intermediate (Provisional) driver's licence constitute a major public health concern. This group comprises inexperienced drivers who are involved in a large number of crashes with high rates of crash involvement. The overrepresentation of young drivers in road crashes is a persistent global road safety problem (European Transport Safety Council, 2011). In Australia in 2011, 17-25 year olds comprised 12.9% of the nation's population, but contributed 21.9% of the road crash fatalities (Bureau of Infrastructure, Transport and Regional Economics, 2012). Moreover, young novice drivers are not the only victims in their road crashes, with their passengers and other road users contributing 40% and 30% respectively to the road toll in Queensland in 2011. The young driver was deemed to be responsible in 78.9% of their fatal crashes, and this primarily is a result of risky driving behaviours like speeding (Department of Transport and Main Roads (DTMR), 2011a). Whilst fatalities are a cause for great concern, 36% of all hospitalised casualties (i.e. non-fatal injuries) across Queensland in 2010 involved a driver aged 17-24 years (DTMR, 2011b). Road crashes were conservatively estimated to cost the Australian economy \$AU27.12 billion in 2006 alone (Tooth, 2010). Clearly young driver road crashes are a significant problem; a problem that is in part preventable if risky behaviours such as substance-impaired driving are reduced.

Substance-impaired driving

Substance-impaired driving, that is driving after drinking alcohol or taking illicit drugs such as marijuana or ecstasy that are known to impair driving, is problematic for drivers of all ages and experience (Kuypers et al., 2012). Substance-impaired driving is also a neurobiological issue for adolescents as their brains continue to develop through to the mid-twenties (Dahl, 2008). Age and alcohol appear to have an interactive effect, rather than a simple additive effect, increasing relative crash risk particularly for the young driver (Peck et al., 2008). Drivers aged 17-20 years killed in New South Wales in 2007 exceeded the legal blood alcohol concentration (BAC) in 63% of fatal crashes, and fatalities among young drivers are 47% more likely to be alcohol-related than those among older drivers (Queensland Transport, 2005). Generally alcohol-involved crashes tend to be more severe (Rosman et al., 2001) with greater risk of driver fatality (Keall et al., 2004). Alcohol-intoxicated young drivers also are more risky drivers, being more likely to travel closer to the vehicle in front (tailgating) (Leung and Starmer, 2005) and experiencing difficulty maintaining lane position

(Harrison & Fillmore, 2005). The likelihood of driving after drinking increases five-fold for the driver who drinks alcohol in conjunction with illegal drugs and the young drink driver is also significantly less likely to wear a seatbelt (Everett et al., 1999).

Illicit drugs such as marijuana (cannabis), speed (meth-amphetamine), cocaine, and ecstasy have been found to negatively impact on driving abilities by reducing alertness and concentration whilst increasing reaction times (Donald et al., 2006). Cannabis is the most popular recreational drug, and it is frequently combined with alcohol (Ronen et al., 2008). Driving under the influence of cannabis has been found to double the risk of car crash for young drivers (Asbridge et al., 2005), and the risk may in fact be greater than that associated with driving under the influence of alcohol (Fergusson et al., 2008). A Danish study reported a 25 times greater risk of harm from driving after using illicit drugs either alone or in combination, increasing to 35 times greater if the driver had also consumed alcohol (Twisk and Stacey, 2007). In Queensland, Australia, young novice drivers must have a zero BAC, and all drivers are prohibited from driving under the influence of illicit drugs.

Other risky driving behaviours

Whilst substance-impaired driving by itself is problematic for young, inexperienced drivers, it may be associated with a range of other risky driving behaviours such as speeding, carrying passengers, and driving tired which are behaviours that are also of concern for young novice driver safety. For instance, young drivers who crashed whilst under the influence of alcohol in the United States between 2005 and 2009 were more likely to be males who were speeding and not wearing a seatbelt, and were carrying passengers on a weekend night (Williams et al., 2011). It is widely understood that driving at higher speeds is associated with greater risk of crashing and increased crash severity (Kloeden et al., 2001), and substance-impairment may result in higher travelling speeds. Common novice driving errors such as not allowing sufficient headway (tailgating) and negotiating right-hand turns (across oncoming traffic in Australia) may also be more likely to occur when the young novice driver is impaired by alcohol and/or illicit drugs. Substance-impairment may negatively impact upon the wearing of seatbelts and the number of passengers carried; young drivers occasionally being found to carry more passengers within the cabin of passenger vehicles than there are seats (and therefore seatbelts) (e.g., see Calligeros, 2009). Also, young drivers drive late at night, a time when the biological need for sleep is greatest, and which may involve alcohol consumption and carrying peers who can be a negative influence upon their behaviour (Papadakaki et al., 2008). Driving whilst tired can contribute to young driver

crashes (Hutchens et al., 2008) through such mechanisms as reduced hazard perception ability and slower reaction times.

Punishment avoidance

Risky driving behaviours, such as speeding, have also been found to be associated with active attempts at avoiding punishment by young drivers (Scott-Parker et al., 2011, 2012a, 2013). Punishment avoidance –which incorporates both evading detection (e.g., avoiding areas where Police enforcement activities are currently being undertaken), and avoiding punishment (e.g., avoiding a traffic citation) – for risky driving behaviours such as substance-impaired driving appears to increase the likelihood that the risky behaviour will be repeated. Recent research framed within Akers’ social learning theory and deterrence theory has confirmed that the experience of punishment avoidance is a strong predictor of non-compliance, particularly speeding (Fleiter and Watson, 2005). In addition young drivers report that punishment avoidance is rewarding (Scott-Parker et al., 2012b), and punishment-avoiders also report more risky driving behaviour in general (Scott-Parker et al., 2011). Avoidance of Police requires the novice driver to ‘pay attention’ to Police presence, and in Queensland, Australia, young drivers report most commonly hearing about on-road Police presence via radio broadcasts and news reports, through friends and family, seeing Police enforcement operations on the road-side, and by other drivers flashing their headlights (Scott-Parker et al., 2011). As such, substance-impaired young novice drivers may actively engage in higher levels of punishment-avoidant behaviour to evade detection and apprehension by Police (Scott-Parker et al., 2011, 2012a, b), using strategies similar to those that have been reported by drivers who actively avoided random breath test (RBT) sites (e.g., avoiding known RBT sites, using back street, Homel, 1989).

Anticipated driving behaviour

A preponderance of road safety research examines the predictors of intentions for a variety of risky driving behaviours for drivers of all ages (e.g., Desrichard et al., 2007; Forward, 2009; Parker et al., 1992), including speeding (e.g., Cestac et al., 2011; Elliott et al., 2003; Elliott and Thomson, 2010), driving under the influence of alcohol (e.g., Beullens & Van den Bulck, 2008; Marcil et al., 2001), and using a mobile whilst driving, including texting (e.g., Nemme and White, 2010; Walsh et al., 2008; Zhou et al., 2008). Research suggests there is a relationship between future intentions and actual driving behaviour (De Pelsmacker and Janssens, 2007). Importantly for the domain of young driver road safety, much adolescent health risk behaviour appears to be as a consequence of adolescents being open to opportunities to be less safe (Gerrard et al., 2003; Ouellette et al., 1999). That is,

rather than rational consideration and evaluation of the negative consequences of risky behaviour, such as crashes whilst speeding (Gibbons and Gerrard, 1995), adolescents demonstrate a willingness to be risky, suggesting they are likely to be risky in the future, rather than intend to be risky in the future. As such, *willingness* is unplanned and spontaneous, whilst *intention* is planned and reasoned. This is particularly the case in the presence of peers, which is characteristic of adolescent behaviour (Gerrard et al., 2003), including within the driving context. As such, both intentions to be risky drivers, and the willingness to be a risky driver in the future, merits further consideration.

Study Aims

The prevalence of substance-impaired driving by young drivers with one year's independent driving experience remains unknown. In addition, the relationship between substance-impaired driving and other risky driving behaviours by this at-risk group remains unexplored. Therefore the aims of the research are (1) to explore the self-reported risky driving behaviours of young novice drivers within the realms of substance-impaired driving, speeding, novice driving errors, general risky driving, and carrying passengers in risky circumstances, one year after progression from a Learner to a Provisional (intermediate) driver's licence; and (2) to explore the interrelationships between substance-impaired driving and other risky driving behaviours, self-reported crashes and offences, Police avoidance, and future driving intentions, one year after progression from a Learner to a Provisional licence.

Method

Participants

Drivers ($n = 1,076$, 319 males) aged 18-20 years ($M = 18.66$, $SD = 0.72$) completed a paper survey one year after obtaining their Queensland Provisional 1 (P1) driver's licence (the first licence in the 3-year intermediate, provisional, licence phase after successfully completing a practical driving assessment). Two thirds (66.4%) of the participants reported their highest level of education was year 12 (senior; 66.8% of males, 66.2% of females), 7.3% completed lower grades of schooling, with the remainder completing trade or tertiary qualifications.

Design and Procedure

Every driver in Queensland who progressed from a Learner to a P1 licence in the period April through June 2010 was sent a paper survey by the state government licensing authority (Department of Transport and Main Roads) on behalf of the research team one year after obtaining their licence. Of the 9,393 drivers aged 18 years and older (there is no upper age limit) who gained their P1 licence during the qualifying period and therefore were eligible to participate, 1,076 surveys were returned by drivers aged 18-20 years and were retained for

the current research project. Whilst the response rate for drivers aged 18-20 years could not be calculated due to limitations in the study design, it is noteworthy that the sample reflected the geographic distribution of the state of Queensland's population, with 62.2% of the participants (61.7% of females, 63.4% of males) residing in inner city areas (which contain 60.0% of the state's population), and 1.6% of the participants (1.9% of females, 0.9% of males) residing in remote areas (which contain 2.0% of the state's population) (Commonwealth Department of Health and Aged Care, 2010).

Materials

The paper survey included items exploring driver gender, age and highest level of education; punishment avoidance through paying attention to, and avoiding, Police (*no, yes*); intentions to bend road rules (1 *definitely will not*, 7 *definitely will*) and willingness to bend road rules (1 *very unlikely*, 7 *very likely*) in the future; and self-reported crash involvement and offence detection (*no, yes*). The survey also contained the 44-item Behaviour of Young Novice Drivers Scale (BYNDS) (Scott-Parker et al., 2010) exploring self-reported risky driving behaviour (1 *never*, 5 *nearly all the time*), including driving after drinking alcohol (herein referred to as 'drink driving') and driving after taking illicit drugs such as marijuana and ecstasy (herein referred to as 'drug driving').

Statistical Analysis

Missing data was not imputed; rather cases were excluded analysis-by-analysis in the Statistical Package for the Social Sciences (SPSS) version 20. Means were compared individually using analysis of variance for items scored on a Likert scale and Pearson chi-square test for categorical items, evaluated at significance $\alpha = .05$.

Results

Table One summarises the self-reported substance-impaired driving, speeding, novice driving errors, general risky driving behaviours, carrying passengers, driving outcomes, and future driving behaviour of the participants. Approximately 14% of participants reported drink driving, and 3% reported drug driving. Generally most participants reported driving up to 10 km/hr over the posted speed limit at least occasionally, with half reporting speeding by 10-20 km/hr and nearly one third by more than 20 km/hr over the posted speed limit. Speeding was also reported by the majority of the participants when they believed they were unlikely to be caught and when they were overtaking, with the majority also reporting speeding up when traffic lights changed to yellow. Approximately half of the participants reported 'racing out' of intersections when the light changed to green, and cornering too quickly, and one quarter of participants reported speeding at night on poorly lit roads.

[Insert Table One here]

A noteworthy proportion of participants reported at least occasionally performing novice driving errors, ranging from one-fifth misjudging the gap turning right (across oncoming traffic lanes in Australia) to nearly half misjudging the stopping distance they needed. Very few participants reported driving through a red light if there was no camera, not wearing seatbelts, and driving for short trips unbelted. One third reported speaking on a handheld mobile and four in five participants reported driving when they knew they were tired. The majority of the participants also reported driving faster if they were in a bad mood, and that their driving was affected by their emotions. Only a small minority of participants reported that they intended to, but almost three times as many participants reported that it was likely they would, bend the road rules in their future driving.

Very few participants reported carrying more passengers than could fit in their cars and for which there were seatbelts, and that their passengers didn't wear seatbelts. Half of the participants reported exceeding the Queensland graduated driver licensing (GDL) night passenger limit of one peer passenger between 11:00pm and 5:00am at least occasionally, while most participants reported driving with a car full of their friends as passengers, and carrying their friends as passengers at night. While most participants reported paying attention to Police presence, one in six reported actively avoiding Police presence. Nearly one quarter of participants reported they had been involved in between one and three crashes during the first year of their P1 licence, with 78.5% of crash-involved drivers reporting one crash only. One quarter of participants reported they had been detected for between one and six offences, with 66.4% reporting one offence only.

As can also be seen from Table One, in general males consistently reported more engagement in both risky and illegal driving behaviours including substance-impaired driving, more punishment avoidance behaviour, and stronger intentions to drive riskily in the future. Female participants tended to report more novice driving errors at least occasionally than male participants. Male participants reported less crash-involvement overall, with both male and female participants reporting they had been involved in between one and three crashes (78.5% of crash-involved males and 87.2% of females reporting one crash only, $p = .08$). Overall, a significantly greater proportion of males reported that they had been detected for an offence, with male participants reporting between one and six offences and female participants reporting between one and five detected offences (66.4% and 76.0% respectively one offence only, $p < .001$). Almost twice as many male as female participants reported they

intended to bend the road rules in their future driving, and males also reported a greater willingness to bend the road rules in future.

Substance-impaired driving

Drink driving

The participants who reported drink driving at least occasionally (herein referred to as 'drinking drivers', $n = 148$) reported a similar level of education (63.5% reported grade 12 as their highest level of education), and were a similar age ($M = 18.57$ years, $SD = .70$) to the participants who did not report drink driving (herein referred to as 'non drinking drivers'), (66.9%, n.s, $M = 18.67$ years, $SD = .73$, n.s). Overall, drinking drivers reported significantly more engagement in drug driving, speeding, novice driving errors, general risky driving behaviour, carrying passengers in risky circumstances, and drinking drivers also reported stronger intentions to drive riskily in the future (see Table Two). A similar proportion of non-and drinking drivers reported they were involved in a crash (23.1% of drinking drivers and non-drinking drivers, n.s.), and of those who crashed, similar numbers of crashes were reported. A significantly greater proportion of drinking drivers reported they had an offence detected (35.8% of drinking drivers, 25.4% of non-drinking drivers, $p < .01$), and of those who were caught offending, drinking drivers reported that they had more offences detected.

[Insert Table Two here]

Of the participants who reported they had been detected for an offence, drinking drivers also reported more offences had been detected than non-drinking drivers. Of the participants who reported crashing, drinking drivers reported they had been involved in slightly more crashes than non-drinking drivers. Thirty-four percent of drinking drivers reported actively avoiding on-road Police presence, compared to 13.5% of non-drinking drivers ($p < .001$).

Drug driving

There was no significant difference in the education level of the participants who self-reported drug driving at least occasionally (herein referred to as 'drug drivers', $n = 30$) (60.0%) and those who did not (herein referred to as 'non-drug drivers', 66.5%), nor their age ($M = 18.60$ years, $SD = .68$; $M = 18.66$, $SD = .73$ drug drivers and non-drug drivers respectively). Consistent with the actual and anticipated driving behaviours of the participants who reported drink driving, in general the participants who reported drug driving also reported significantly more engagement in drink driving, speeding, novice driving errors, general risky driving behaviour, and carrying passengers in risky circumstances. Drug drivers also reported stronger risky driving intentions (see Table Two). Slightly more drug drivers

reported they were involved in a crash (28.6% of drug drivers, 23.0% of non-drug drivers, n.s.), and of those who crashed, more crashes were reported by drug drivers. A greater proportion of drug drivers reported they had an offence detected (40.0% of drug drivers, 26.5% of non-drug drivers, $p = .07$), and of those who were caught offending, drug drivers reported that they had significantly more offences detected.

Of the participants who reported they had been detected for an offence, drug drivers also reported significantly more offences, and more offences than drink drivers. Of the participants who reported crashing, drug drivers also reported they had been involved in slightly more car crashes. Thirty-seven percent of drug drivers reported actively avoiding on-road Police presence, compared to 15.7% of non-drug drivers ($p < .01$).

Drink and drug driving

Thirteen participants (10 males) reported that they had engaged in both drink driving and drug driving, and these participants were of similar age to drivers who did not engage in both drink and drug driving (drink and drug driving $M = 18.46$, $SD = .66$; non-drink and -drug driving $M = 18.66$, $SD = .73$). Not surprisingly, the participants who reported both drink and drug driving also engaged in considerably more risky driving evidenced as speeding, novice driving errors, general risky driving behaviour, and carrying passengers in risky circumstances; however, the small sample size precluded confidence in comparison of means. Seven of the drink and drug drivers (53.8%) reported they had been detected for between one and six offences. Two of the drink and drug drivers (15.4%) reported they had crashed between one and three times. Drink and drug driving participants also reported significantly more risky anticipated driving (30.8% intended to bend, and 53.9% reported it was likely they would bend road rules in the future), and avoidance of Police (53.8% of drivers), compared to non-drink and -drug driving participants (8.9%, 23.7%, and 13.2% respectively).

Discussion

The research findings provided unique insight into the prevalence of substance-impaired driving by Queensland young drivers with only one year's independent driving experience. In addition, a greater understanding of the young driver's engagement in risky behaviours such as speeding, novice driving errors, general risky driving, carrying passengers in risky circumstances, and deliberate punishment avoidance experiences was also gained. Further, the relationship between substance-impaired driving and the breadth of other risky driving behaviours by this at-risk group was also explored.

Practical implications

A number of practical implications arise from the research findings. The prevalence of impaired driving amongst young novice drivers has been heretofore unknown: the present research found that one in six of the participants – young drivers with only one year's independent driving experience – reported at least occasionally drink driving. Laws addressing blood alcohol concentration in particular are highly effective (Fell and Voas, 2006; Homel, 1994; McCartt et al., 2009), and roadside checks for drink driving have been found to not only reduce the rate of alcohol-involved crashes, but to reduce the rate of all crashes (Erke et al., 2009). Pleasingly very few drivers reported drug driving. Furthermore, most drug drivers were also drink drivers, suggesting that current RBT efforts which are augmented by roadside saliva-based drug testing should continue, rather than divert resources to drug driving detection efforts only. The Provisional period is the most risky licence phase experienced by the driver. Moreover, impaired driving is associated with considerably-increased crash risk (e.g., Peck et al., 2008), and whilst generally alcohol-involved crashes have reduced since the introduction of RBT in Australia (e.g., Homel, 1989), which has led to a cultural shift in the acceptability of drink driving, the interactive relationship between impairment and inexperience appears to warrant such directed intervention. The desirability of transportation alternatives in particular also need to be considered in intervention development, particularly as young drivers report that the desirability of alternative transportation is more important than its availability (Nygaard et al., 2003). Problem young drivers (e.g., Scott-Parker et al., 2013) who drink and/or drug-drive may benefit from targeted interventions like motivational interviewing which has been found to reduce the probability of an offence detected during the subsequent 6 month period (Nirenberg et al., 2013).

The alarming proportion of young drivers who reported at least occasionally driving in excess of speed limits, and the rates of speeding reported by substance-impaired drivers in particular, suggests that increased enforcement of speed limits is required generally. In addition, whilst some jurisdictions may require drivers detected for drink driving to have alcohol ignition interlock devices fitted to their vehicles upon relicensing (e.g., Victoria, VicRoads 2012), the research findings suggest that other technology such as speed limiting devices (e.g., Lahrmann et al., 2012) may also prove beneficial in young driver road safety, and for offending young drivers in particular. The prevalence of speeding appears to reflect pervasive cultural acceptance, and may also be a continuation of habits developed and not checked during the Learner period (Scott-Parker et al., 2012). Young drivers imitate the driving behaviour modelled by their parents and their peers (e.g., Taubman-Ben-Ari et al., 2012), and this likely has contributed to a gradual reduction in drink driving over time since

RBT was introduced. In contrast, there has not been a commensurate reduction in speeding. A cultural change towards speeding is possible. In Australia seat belt wearing rates were low prior to the introduction of mandatory seat belt wearing laws, and enforcement of these laws in addition to the realisation that seat belts save lives has played a role in the cultural shift which saw nearly every participant reporting wearing their seatbelt in the current research. A similar shift in the culture of speeding can be achieved by operationalisation of the deterrence philosophy which underpins the effectiveness of RBT (Scott-Parker et al., 2013a, 2013b). As such, this change requires enforcement as its cornerstone, in addition to the broader internalisation of the very real risk of injury associated with speeding.

The breadth of novice driving errors performed by the participants at least occasionally, effectively *two years* after they began driving (Queensland's Learner licence phase is a minimum one year duration, and participants were recruited one year after gaining their P1 licence) suggests that a more structured approach to the Learner period may be required. The Learner licence phase allows the novice driver to develop and reinforce safe driving skills, and a third of the young drivers reported still making critical errors such as misjudging the speed of an oncoming vehicle which is crucial to both overtaking a vehicle in front or turning across traffic, and misjudging their own speed when exiting a main road. Disturbingly nearly half of the young drivers reported misjudging the stopping distance they needed, which may contribute to rear-end crashes at low speed in particular.

Almost half the participants reported violating the night-time passenger restrictions required by Queensland's GDL program at least occasionally, with participants who reported substance-impaired driving also reporting more frequent passenger limit violations. Such high non-compliance rates means that the benefits of Queensland's GDL program is not being realised for a considerable proportion of Queensland's youth. As such targeted enforcement is warranted, particularly as some young drivers, and substance-impaired young drivers specifically, reported carrying more passengers than could legally fit in their car and for whom there were seatbelts. A sizeable proportion of young drivers also reported using a handheld mobile while driving, in violation of both GDL-specific and general road rules. Broad mobile phone interventions and the GDL restrictions do not appear to be reaching these young drivers, therefore additional interventions merit further investigation.

Characteristic of adolescence is a busy lifestyle, with a variety of demands including education, employment, family or carer responsibilities, and an active social life competing for the time and attention of the young driver. In addition, developmental factors mean that the adolescent's circadian rhythms can be disrupted, with a corresponding greater need for

sleep which further impacts upon the young driver's lifestyle (Groeger, 2006). Such competing interests and pressures may explain why more than 4 in 5 participants reported driving when they felt that they were tired – suggesting an impairment in their capacity to maintain attention and alertness to the driving task – an extremely risky behaviour. Interestingly, young drivers report that they can perceive their sleepiness and the effects it is having on their driving, with fatigued drivers indicating they would keep driving whilst implementing efforts to stay awake such as singing and lowering the car windows (Lucidi et al., 2006). This suggests that driving to and arriving at their destination as planned is more important than resting when they perceive that they are fatigued. Analysis of accident-involved Norwegian drivers of all ages revealed that younger age was associated with fatigue-involved crashes and reports of falling asleep behind the wheel, particularly for young males (Phillips & Sagber, 2013), indicating that targeted interventions which highlight the risks associated with driving tired, incorporating suggestions for journey planning including transportation alternatives and effective time management practices, are required. Also characteristic of adolescence is heightened emotions and sensation seeking behaviour. Three in five adolescents reported driving in response to their moods, and specifically to driving faster if they were in a bad mood, at least occasionally. Rather than an efficient and economical method of getting from the point of departure to the destination, young drivers report driving serves a multitude of purposes, including being an outlet for emotional outbursts and resolving emotional distress (e.g., Redshaw, 2006). Targeted interventions which similarly highlight the riskiness of this driving purpose, in addition to alternatives to resolve emotional distress, are required.

Almost a quarter of young males reported active attempts to avoid on-road Police presence, and presumably thus evaded detection for driving-related offences. Further, a closer inspection of the rates of engagement in the breadth of illegal driving behaviours examined in the current research coupled with the low rates of offences reported by the participants indicates that the likelihood of being detected for a driving-related offence is low. Unfortunately other research has found that young drivers perceive such punishment avoidance as reinforcing, and as such the behaviours can be expected to be repeated (Scott-Parker et al., 2012b). This is not consistent with the deterrent effect desired from both broad and targeted enforcement efforts, therefore a general optimisation of enforcement is recommended through such mechanisms as random deployment of multiple enforcement methods (e.g., random breath testing, mobile speed cameras, automatic number plate recognition), in addition to efforts to minimise punishment avoidance. In addition, efforts to

increase the perceived legitimacy of enforcement methods, particularly for drivers who drink-drive (e.g., Politis et al., in press) and drug-drive, may contribute to reductions in these risky behaviours. Further, the findings suggest that gender-specific interventions merit further consideration. Consistent with their overrepresentation in road crash injuries and fatalities, male participants reported considerably more current and anticipated risky driving behaviour.

Finally, a preponderance of road safety research operationalises the term and concept of *intentions*. Whilst the research was not longitudinal in nature, further examination of the results reveals a discrepancy between future driving intentions and current driving behaviour. That is, whilst most of the young driver participants' report that they *do not intend* to bend the road rules, most of the young driver participants reported that they *did* bend the road rules. Perhaps the term and concept of *willingness* is more suited to young driver research and to guide intervention development and implementation: a far greater proportion of young driver participants reported that they were indeed willing to bend the road rules in their future driving, which is more consistent with their recent self-reported driving behaviour.

Limitations

Whilst a number of strengths are associated with the research, such as an exploration of recent and anticipated self-reported risky driving behaviours which cannot be gleaned through any other mechanism (noting a very high correlation between official and self-report of crashes and offences, e.g., see Boufous et al., 2010), a number of limitations should be borne in mind. Self-reported and official records of offences and crashes were not compared due to limitations in the study design. Participants were asked if they were crash-involved, and not if they were deemed to be at fault in the crash, which may have implications for impaired driving in particular. Interestingly, impairment may have precluded effective efforts to avoid being crash-involved in the first instance, irrespective of the primarily retributive (i.e., insurance, liability, and enforcement implications) assignment of at-fault liability in the Queensland crash reporting system. It is also noteworthy that whilst some information regarding the risky driving behaviours of interest could be obtained through alternative means such as government offence and crash records, these sources have their own strengths and limitations, (e.g., see Scott-Parker and Senserrick, 2013). Recent South Australian research found that 9.6% of 49,536 young drivers had a crash recorded in a government database during the first year of driving (Kloeden, 2008), whereas in this study 23.0% of drivers reported having been involved in a crash. Although it would appear that the study sample is therefore comprised of particularly risky drivers, this difference may be accounted for (at least in part) by the reporting criteria for crashes, since property damage crashes that cause

less than \$A2500 damage (excluding the driver's car) are not reportable in Queensland (Queensland Police, 2013). The same South Australian research (Kloeden, 2008) found that 15.6% of first year drivers in South Australia had at least one offence, whereas 26.8% of the sample in this study reported an offence. This is less easy to explain because the relevant police publications for South Australia and Queensland do not provide information which would enable comparison of levels of enforcement activity relevant to young drivers.

Whilst the response rate could not be determined for drivers aged 18-20 years specifically as the number of eligible drivers aged 18-20 years was unknown, the majority of Queensland's Provisional drivers are younger; therefore the response rate is likely to be quite low. Notwithstanding this limitation, as noted earlier the state-wide distribution of the sample represented the state-wide distribution of Queensland's population. In addition, it is not possible to determine at this time if and how the participants who did elect to participate in the study differ from those who did not, particularly males who comprise 52.1% of the drivers aged 18-20 years in the P1 driving population of Queensland (DTMR, 2012). Given that the greater part of the sample was female, separate gender-based analyses were conducted.

Future research

Future research which operationalises the concept of willingness could also examine the actual and anticipated self-reported driving behaviours and official offence and crash records of crash-involved and offender young drivers respectively, particularly for instances when the young driver was at fault in the crash. A representative sample of young drivers could be followed from time of independent licensure (i.e., the start of the Provisional licence phase) to examine the influence of a range of variables upon the young driver's substance-impaired driving, such as parents, peers, and personal characteristics like sensation seeking propensity, to identify precursors to the substance-impaired driving. Developmental influences in particular could be further explored through comparison of younger novices' perceptions, experiences and behaviour, with the perception, experiences and behaviours of 'older' novices (Scott-Parker et al., 2013b), uniquely informing countermeasure development and implementation. In addition, the relationship between the breadth of risky driving behaviours could be further examined, particularly for speeding which appears to be a normative (albeit risky) driving behaviour. This information is crucial for the development and implementation of both broad and targeted countermeasures.

Conclusion

Young drivers are at considerable risk on the road, and the first year of independent driving is the most risky time for all young novice drivers. Substance-impaired driving including drink driving and drug driving, speeding, novice driving errors, general risky driving, carrying passengers in risky circumstances, punishment avoidance, and risky anticipated driving behaviours have been found to increase the crash risks for young novice drivers, placing themselves, their passengers, and other road users at greater risk of injury and death. Substance-impaired young drivers report the most risky current and anticipated driving behaviour, suggesting that targeted countermeasures such as random breath and saliva testing are required. In addition, interventions targeting the tired young driver and the speeding young driver are warranted, as are efforts to reduce the benefits of, and opportunities for, active punishment avoidance.

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Table One

Proportion of young drivers reporting *at least occasionally performing behaviour*, crash-involvement and offence-detection, and future driving, by gender.

Risky driving behaviours, future driving intentions, crashes and offences	Proportion (%) of drivers		
	Total <i>N</i> = 1077	Males <i>N</i> = 319	Females <i>N</i> = 758
<i>Substance-impaired driving</i> ^{1 a}			
When thought over legal alcohol limit	13.8	18.5	11.8 ***
After taking illicit drugs	2.8	6.3	1.3 ***
<i>Speeding</i> ^{1 a}			
Up to 10 km/hr over speed limit	86.7	77.8	86.3 **
Went 10-20 km/hr over speed limit	53.6	58.9	49.9 ***
More than 20 km/hr over speed limit	33.4	42.9	29.4 ***
Over speed limit if detection unlikely	66.5	69.5	65.2 **
Sped up when lights went yellow	78.7	74.9	80.3
Deliberately sped when overtaking	70.8	76.0	68.6 ***
Raced out of intersection on green light	51.9	60.4	48.3 **
Sped at night on poorly-lit roads	24.7	33.5	21.0 ***
Too fast around a corner	49.0	47.5	49.6
<i>Novice driving errors</i> ^{1 a}			
Misjudged speed exiting main road	36.3	31.2	38.4
Misjudged stopping distance needed	47.3	37.9	51.2 **
Misjudged gap overtaking	20.9	18.2	22.0
Misjudged gap turning right	20.2	16.9	22.5
Misjudged speed oncoming vehicle	33.3	26.1	36.3 **
Turned right into path of vehicle	14.7	16.6	13.9
<i>General risky driving</i> ^{1 a}			
Spoke on handheld mobile	33.4	42.6	38.4
Drove through red light if no camera	4.9	8.5	3.4 ***
Didn't always wear seatbelt	5.8	7.8	5.0 *
Didn't wear seatbelt for short trip	7.3	10.3	6.1 **
Drove when knew were tired	83.6	82.1	84.3
Drove faster if in bad mood	55.8	54.8	56.2

Driving affected by emotions	65.0	62.1	66.2
<i>Carrying passengers in risky circumstances</i> ^{1 a}			
Exceeded night passenger limits ²	49.8	51.9	48.9
Passengers didn't wear seatbelts	5.2	6.6	4.6
Carried more passengers than seatbelts	3.4	6.6	2.2 *
Carried more passengers than legally fit	3.4	6.6	2.1 **
Car full of friends as passengers	72.5	73.3	72.2
Carried friends as passengers at night	79.9	80.6	79.6
<i>Punishment avoidance</i>			
Pay attention to Police presence	91.6	89.7	92.8
Avoid Police presence	16.3	25.1	12.5 ***
<i>Driving outcomes</i>			
Crash-involved	23.0	19.7	24.4
Offence-detected	26.8	35.1	23.4 **
<i>Future driving</i>			
Intend to bend road rules	9.1	13.2	7.4 ***
Likely to bend road rules	24.1	29.2	22.0 ***

^a Proportion of drivers who reported at least occasionally performing these behaviours.

¹ Selected items from the Behaviour of Young Novice Drivers Scale (BYNDS; Scott-Parker et al., 2010) except for 'Exceeded night passenger limits'.

² GDL night passenger limit restriction (≤ 1 peer passenger 11pm-5am).

* $p < .05$, ** $p < .01$, *** $p < .001$. Significant gender differences are bolded for ease of reference. Bonferroni adjustments were not made (e.g., see Perneger, 1998).

Table Two

Means (and standard deviations) for the risky driving behaviours, future driving intentions, and number of crash-involvements and offences-detected.

Risky driving behaviours, future driving intentions crash-involvement and offences	<u>Drink-Drive <i>M (SD)</i></u>		<u>Drug-Drive <i>M (SD)</i></u>	
	No	Yes	No	Yes
	<i>N</i> = 928	<i>N</i> = 148	<i>N</i> = 1046	<i>N</i> = 30
<i>Substance-impaired driving</i> ^{1 a}				
When thought over legal alcohol limit	—	—	1.15 (.41)	1.80 (1.19) ***
After taking illicit drugs	1.04 (.35)	1.14 (.52) **	—	—
<i>Speeding</i> ^{1 a}				
Up to 10 km/hr over speed limit	2.50 (.98)	3.03 (1.00) ***	2.56 (.99)	2.93 (1.08) *
Went 10-20 km/hr over speed limit	1.65 (.78)	2.24 (1.02) ***	1.72 (.83)	2.17 (1.09) **
More than 20 km/hr over speed limit	1.38 (.66)	1.87 (.94) ***	1.44 (.71)	1.80 (1.06) **
Over speed limit if detection unlikely	1.97 (.95)	2.68 (1.14) ***	2.05 (1.00)	2.63 (1.22) **
Sped up when lights went yellow	2.19 (.94)	2.76 (1.07) ***	2.26 (.98)	2.37 (1.03)
Deliberately sped when overtaking	2.09 (1.05)	2.88 (1.14) ***	2.19 (1.09)	2.70 (1.34) *
Raced out of intersection on green light	1.72 (.93)	2.36 (1.13) ***	1.81 (1.00)	2.03 (.96)
Sped at night on poorly-lit roads	1.27 (.58)	1.79 (1.10) ***	1.32 (.68)	2.13 (.94) ***
Too fast around a corner	1.55 (.68)	1.84 (.70) ***	1.59 (.69)	1.47 (.63)
<i>Novice driving</i> ^{1 a}				
Misjudged speed exiting main road	1.40 (.58)	1.62 (.89) ***	1.42 (.61)	1.83 (1.26) ***

Misjudged stopping distance needed	1.53 (.65)	1.74 (.69) ***	1.55 (.65)	1.70 (.92)
Misjudged gap overtaking	1.19 (.44)	1.55 (.75) ***	1.23 (.48)	1.63 (1.03) ***
Misjudged gap turning right	1.21 (.47)	1.34 (.64) **	1.22 (.47)	1.57 (1.04) ***
Misjudged speed oncoming vehicle	1.36 (.56)	1.50 (.70) ***	1.37 (.57)	1.57 (.90)
Turned right into path of vehicle	1.15 (.39)	1.27 (.52) **	1.15 (.40)	1.43 (.68) ***
<i>General risky driving</i> ^{1 a}				
Spoke on handheld mobile	1.48 (.76)	1.99 (.90) ***	1.55 (.80)	1.63 (.72)
Drove through red light if no camera	1.05 (.25)	1.16 (.54) ***	1.05 (.26)	1.47 (.97) ***
Didn't always wear seatbelt	1.06 (.33)	1.23 (.63) ***	1.07 (.34)	1.43 (1.10) ***
Didn't wear seatbelt for short trip	1.08 (.37)	1.32 (.77) ***	1.10 (.42)	1.43 (1.10) ***
Drove when knew were tired	2.36 (.95)	2.97 (.99) ***	2.43 (.97)	2.67 (1.12)
Drove faster if in bad mood	1.81 (.91)	2.49 (1.16) ***	1.90 (.98)	2.20 (.96)
Driving affected by emotions	1.91 (.92)	2.56 (1.08) ***	1.98 (.96)	2.63 (1.25) ***
<i>Carrying passengers in risky circumstances</i> ^{1 a}				
Exceeded night passenger limits ²	1.76 (.97)	2.17 (1.16) ***	1.80 (1.00)	2.33 (1.32) **
Passengers didn't wear seatbelts	1.06 (.33)	1.16 (.51) **	1.07 (.35)	1.27 (.58) **
Carried more passengers than seatbelts	1.03 (.19)	1.15 (.58) ***	1.04 (.24)	1.40 (.81) ***
Carried more passengers than legally fit	1.03 (.23)	1.10 (.42) **	1.04 (.23)	1.23 (.77) ***
Car full of friends as passengers	2.30 (1.12)	2.64 (1.13) **	2.36 (1.12)	2.20 (1.27)
Carried friends as passengers at night	2.37 (1.05)	2.74 (1.03) ***	2.41 (1.05)	2.60 (1.10) *
<i>Driving outcomes</i>				
Number of crashes	1.16 (.42)	1.20 (.41)	1.14 (.41)	1.44 (.53)

Number of offences	1.35 (.72)	1.55 (.90)	1.35 (.69)	2.00 (1.47) **
<i>Future driving</i>				
Intentions	2.18 (1.36)	3.35 (1.61) ***	2.32 (1.43)	3.20 (1.77) **
Willingness	2.96 (1.67)	4.28 (1.78) ***	3.14 (1.72)	3.23 (2.34)

^a Proportion of drivers who reported at least occasionally performing these behaviours.

¹ Selected items from the Behaviour of Young Novice Drivers Scale (BYNDS; Scott-Parker et al., 2010) except for '*Exceeded night passenger limits*'.

² GDL night passenger limit restriction (≤ 1 peer passenger 11pm-5am).

* $p < .05$, ** $p < .01$, *** $p < .001$. Significant gender differences are bolded for ease of reference. Bonferroni adjustments were not made (e.g., see Perneger, 1998).

— = not applicable.