Title

Revisiting the concept of the 'problem young driver' within the context of the 'young driver problem': Who are they?

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Abstract

For decades there have been two young driver concepts: the 'young driver problem' where the driver cohort represents a key problem for road safety; and the 'problem young driver' where a sub-sample of drivers represents the greatest road safety problem. Given difficulties associated with identifying and then modifying the behaviour of the latter group, broad countermeasures such as graduated driver licensing (GDL) have generally been relied upon to address the young driver problem. GDL evaluations reveal general road safety benefits for young drivers, yet they continue to be overrepresented in fatality and injury statistics. Therefore it is timely for researchers to revisit the 'problem young driver' concept to assess its potential countermeasure implications. This is particularly relevant within the context of broader countermeasures that have been designed to address the 'young driver problem'. Personal characteristics, behaviours and attitudes of 378 Queensland novice drivers aged 17-25 years were explored during their pre-, Learner and Provisional 1 (intermediate) licence as part of a larger longitudinal project. Self-reported risky driving was measured by the Behaviour of Young Novice Drivers Scale (BYNDS), and five subscale scores were used to cluster the drivers into three groups (high risk $n=49$, medium risk $n=163$, low risk $n=166$). High risk 'problem young drivers' were characterised by greater self-reported pre-Licence driving, unsupervised Learner driving, and speeding, driving errors, risky driving exposure, crash involvement, and offence detection during the Provisional period. Medium risk drivers were also characterised by more risky road use than the low risk group. Interestingly problem young drivers appear to have some insight into their high-risk driving, since they report significantly greater intentions to bend road rules in future driving. The results suggest that tailored intervention efforts may need to target problem young drivers within the context of broad countermeasures such as GDL which address the young driver problem in general.

Experiences such as crash-involvement could be used to identify these drivers as a pre-intervention screening measure.

Keywords: Young driver; novice; problem young driver; graduated driver licensing; cluster

1. Introduction

1.1. The 'young driver problem' or the 'problem young driver'

Two conceptualisations of the young driver and their crash risks can be found in the extant road safety literature: the 'young driver problem' and the 'problem young driver' (Crettenden and Drummond, 1994). The 'young driver problem' concept recognises the elevated crash risk of the entire cohort of young drivers as evidenced by their overrepresentation in road crashes and the fatalities and injuries arising from these crashes. To illustrate, in Australia in 2011, 17-25 year olds comprised 12.9% of the nation's population, but constituted 21.9% of the road crash fatalities (Bureau of Infrastructure, Transport and Regional Economics, 2012). In comparison, the concept of the 'problem young driver' assumes that a *sub-sample* of young drivers, rather than the young driver population as a whole, presents the greatest road safety challenge, and this is suggested to be through their preparedness to engage in risky driving behaviour (Senserrick, 2006). To demonstrate, 2.5% of young novice drivers in South Australia between July 1998 and June 2001 were detected for a speeding offence during the first six months of driving with a Provisional license, and their speeding offences were found to predict future speeding offences and future road crashes (Kloeden, 2008). Further, in Queensland in 2009, 24 885 traffic offences were recorded for drivers aged 17-25 years with a Provisional 1 (see section 1.2.) licence. Of these drivers, 64.6% had no driving offence history (74.5% of female drivers; 60.1% of male drivers), whilst 15.3% had at least two prior offences (9.0% of female drivers; 18.2% of male

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drivers (DTMR, 2012). Accordingly, it appears that there is a noteworthy proportion of young drivers who repeatedly undertake risky driving behaviour. Therefore this paper focuses on the 'problem young driver' within the broader context of the 'young driver problem'.

Reliably identifying 'problem young drivers' has to date proved to be a challenging task for researchers for a variety of reasons, including the lack of an operational definition and membership-criterion (e.g., single- vs. multiple-crash involved) and high rates of false-positives (that is, non-problem drivers identified as problem drivers) in the analyses (Crettenden and Drummond, 1994). Notwithstanding these limitations, some gender-related patterns have emerged such that males appear over-represented in the most high risk driver groups. In addition, for young novice drivers in general, sensation seeking propensity (Jonah, 1997), and psychological distress, including anxiety and depression (Scott-Parker et al., 2011a), have been found to be associated with more on-road risky driving behaviour.

Some research has examined the personal characteristics of the general young driver population in an attempt to identify problem young drivers. For example, Ulleberg (2002) considered the sensation seeking propensity, trait aggression, anxiety, altruism, and normlessness (conceptualised as a belief that behaviours do not necessarily have to be socially-sanctioned) of 2498 drivers aged 18-23 years who had held a licence for at least 3 months. The young drivers also completed seven items from the Driving Anger Scale and self-reported their crash involvement. Six clusters of drivers were identified according to their combination of personal traits; however only five groups could be clearly identified, including two high- and three low-risk groups. In general, the two high-risk groups reported greater sensation seeking propensity and driving anger (that is, a greater tendency to become angry in response to traffic circumstances), more risky driving attitudes, crash-involvement, and driving in excess of posted speed limits, compared to the three low-risk groups. In addition, Wundersitz (2007) examined the characteristics of 270 university undergraduate

psychology students aged 17-21 years who held a Provisional drivers' licence and identified four clusters according to personality, hostility and aggression, and driving-related aggression. The high-risk cluster reported more detected offences and greater crash involvement, and greater sensation seeking than the low-risk cluster.

Other research has examined self-reported driving behaviours to identify problem young drivers. For example, a longitudinal sample of 1135 Victorian drivers aged 19-20 years who had held a Learner or Provisional licence for an average of nearly 21 months were grouped into three clusters of increasing risk according to their engagement in behaviours such as speeding by up to 10 kilometres per hour (km/hr), driving whilst tired, and driving whilst not wearing a seatbelt (Vassallo et al., 2007). The low-risk group comprised nearly two-thirds of the sample with 39% being male; the high-risk group comprised 7% of the sample and 77% were male. The high-risk group also reported significantly more speeding violations and crash involvement than the low-risk group, which was subsequently confirmed through official Police records (Vassallo et al., 2008).

Thus far in the literature there appears to be a consensus that a problem young driver population exists; however there is no agreement regarding the specific characteristics – sociodemographic, attitudinal, behavioural or other – identifying this group. This lack of consensus may have contributed to the limited attention given to the consideration, development, implementation and evaluation of countermeasures specifically targeting this risky subgroup. In contrast, the broader young driver problem is readily recognised and has prompted countermeasures such as graduated driver licensing.

1.2. *Graduated driver licensing*

Difficulties associated with identifying the sub-group comprising problem young drivers, in addition to the heightened risk experienced by all young drivers, have led to the introduction and refinement of broad countermeasures such as graduated driver licensing

(GDL) programs. Of relevance to this research, the GDL program in Queensland, Australia, was considerably enhanced in July 2007. Key changes included a longer Learner period (increased from 6 to 12 months, Learner age decreased from 16.5 years to 16 years) with a minimum of 100 hours of supervised driving practice (minimum of 10 at night) recorded in a logbook. Learners must be supervised at all times. After passing the practical driving assessment, Learners progress to a Provisional 1 (P1) (intermediate) licence which must be held for a minimum of 12 months (Queensland Transport, 2007)[1].

GDL evaluations reveal that the most restrictive programs produce the greatest road safety benefits, for the youngest novice drivers in particular (Masten et al., 2011). It is noteworthy, however, that young drivers continue to be overrepresented in road crash, injury and fatality statistics, suggesting that interventions targeting particular groups of young novice drivers may be required in addition to broad countermeasures such as GDL. Further, it appears that a stalemate may have been reached in the considerable young driver road safety benefits associated with the current structure of broad interventions such as GDL programs (Williams, 2011), suggesting the need for specific interventions targeting 'problem young drivers' to augment GDL programs. As such, identifying just who to target, and when, appears to be the most promising direction for achieving further improvement in young driver road safety. Some way of reliably identifying these high-risk groups is therefore required, and recent research conducted by the authors (e.g., Scott-Parker et al., 2011a, 2012a, 2012b, 2012d, 2013) and others (e.g., Begg et al., 2010; Senserrick et al., 2010) are promising in this regard. Thereforewhilst broad countermeasures such as GDL merit continued application and refinement, it is timely that the concept of the problem young driver – within the broader construct of the young driver problem – be revisited. Of particular interest is establishing what personal characteristics, attitudes and/or behaviours, if any, could be used to effectively identify problem young drivers. Determining such indicators could also be helpful in

identifying when and which interventions need to be used to target the young problem driver if further advances in reducing the burden of young driver crashes are to be made.

1.3.1. Study aims

A considerable stumbling block to addressing the problem young driver has been how to best identify them. Therefore, this research was designed to bring some consensus to the question of 'who is the problem young driver?', rather than address the more general question of 'who comprises the young driver population?' Accordingly the research used cluster analyses to categorise young novice drivers into groups of differing risk (and by extension differing *crash* risk) according to their self-reported driving behaviours. The personal and driving characteristics of the young novice drivers were then examined and compared according to these groupings. As such, the study uses self-report measures to identify problem young drivers by exploring their driving behaviours and attitudes, and their personal characteristics. Importantly, identifying the problem young driver is the crucial first step towards identifying the countermeasures that may be used to overcome the challenges posed by this sub-group of young novice drivers.

2.   Method

2.1.   Participants

Drivers aged 17-25 years ($n = 1170$, 709 females, $M = 17.90$ years, $SD = 1.51$) completed a first survey when they progressed from a Learner to a Provisional 1 (P1) licence (14.4% of eligible Learners of all ages volunteered to participate, and drivers aged more than 25 years were not retained in this study). A subset of drivers from the same sample ($n = 378$, 265 females, $M = 18.22$ years, $SD = 1.59$) completed a second survey six months later (a 66.9% attrition rate). The analyses and results pertain only to the novice drivers who completed both surveys, however it is noteworthy that a significantly greater proportion ($p < .001$) of female novices participated in *both* surveys.

2.2. *Design and procedure*

Every driver in Queensland, Australia, who progressed from a Learner to a P1 licence in the period April through June 2010 was invited to participate in a larger longitudinal research project via a flyer handed to them when they attended the government licensing agency. The first survey, the Learner Survey, explored pre-Licence and Learner GDL and driving experiences, including self-reported illegal activities including pre-Licence driving (yes, no) , unsupervised driving on a Learner's licence (*yes, no*), and the submission of logbooks with inaccurate entries (*accurate, rounding up/extra hours included*).

Six months later participants who completed the Learner Survey were invited to complete the Provisional Survey exploring P1 driving experiences (e.g., talking themselves out of a ticket, *yes, no*), and attitudes (e.g., dangerousness of bending [2] road rules). Personal characteristics were explored in both surveys, including their employment status (*full-time, part-time/not employed*), anxiety and depression using Kessler's Psychological Distress Scale (K10, Kessler and Mroczek, 1994, cited in Andrews and Slade, 2001), reward sensitivity using an abridged sensitivity to reward questionnaire (Scott-Parker et al., 2013), and sensation seeking propensity via the 8-item Brief Sensation Seeking Scale (BSSS, Hoyle et al., 2002).

Self-reported driving behaviours were examined using the Behaviour of Young Novice Drivers Scale [3] (BYNDS, Scott-Parker et al., 2010) comprising transient violations (risky driving behaviours that can change throughout the journey, such as speeding and using hand-held mobile phones), fixed violations (risky driving behaviours that are not transient in nature, such as not wearing seatbelts and driving a high-powered vehicle), misjudgements (driving errors such as misjudging the speed of an oncoming vehicle or the size of the gap when turning right), risky exposure (driving at times/in states that are particularly risky for the young novice driver, such as at night and with a car full of friends), and driver mood (in

which driving behaviour is influenced negatively by the young novice driver's mood). In addition a speeding subscale was extracted from the BYNDS's transient violations subscale to provide a specific measure of self-reported speeding (Scott-Parker et al., 2012d, 2013) (see Table 1).

[Insert Table 1]

2.3. Statistical analyses

Cluster analysis of the five BYNDS subscale scores (from the Provisional Survey) was undertaken via a two-step clustering technique using the Euclidean distance and Schwartz's Bayesian Criterion, designed to minimise the within-cluster variance whilst maximising the between-cluster variance. A proposed five-cluster solution was examined initially for meaningfulness, and subsequent examination of alternative two-, three-, and four-cluster solutions resulted in the selection of a three-cluster solution. Figure 1 illustrates the minimum, maximum and median BYNDS subscale scores for each cluster. The centroids for each BYNDS subscale (after a Bonferroni adjustment had been applied) according to cluster number are provided as means in Table 2. Statistical analyses included Pearson's chi-square test, and means were compared via analysis of variance, the Kruskal-Wallis test, and the Wilcoxon-signed rank test, evaluated at significance $\alpha = .05$. Missing data were not imputed; rather cases were excluded in each analysis. Online surveys were administered via KeySurvey Enterprise Software. Analyses were conducted via PASW 18.

[Insert Figure 1]

[Insert Table 2]

3. Results

Three clusters of drivers were identified using the self-reported BYNDS subscale scores as P1 drivers (Table 2). Sociodemographic, Learner and P1 driving behaviours and attitudes were then examined according to the three clusters. Cluster One contained 13% of

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the participants and comprised the most risky drivers (high-risk), potentially the 'problem young drivers'. Clusters Two (medium-risk) and Three (low-risk) each contained 43% of the sample. Whilst there were only modest, non-significant differences in gender composition between clusters, the high-risk group contained a significantly larger proportion of younger drivers (proportion of 17-year old drivers: high-risk: 53.1%; medium-risk: 39.9%, low-risk: 39.8%, $p < .001$). Approximately twice the proportion of the high-risk drivers as the low-risk drivers were employed full-time, which may have facilitated their somewhat greater car ownership rates. There were also significant differences in the self-reported anxiety and depression, reward sensitivity and sensation seeking propensity between the three groups, with the high-risk group reporting higher levels of each characteristic than the other two driver groups, and the low-risk group in particular.

There were significant differences in the rates of self-reported risky driving, not only as pre-Licence drivers but also as unsupervised Learners, between the three clusters. The high-risk group reported considerably greater involvement in these risky driving behaviours; and 55.6% of the high-risk drivers reported *both* pre-Licence driving and unsupervised Learner driving, compared to 30.4% ($p < .05$) of the medium-risk group and 20.0% ($p = .20$) of the low-risk group. Unsupervised driving in particular may also have contributed to the high-risk drivers' reports of less accurate logbooks. The high-risk group also reported more 'extra hours' had been added to their logbooks (high-risk: 12.2%; medium-risk: 5.5%, low-risk: 1.8%, $p < .001$).

Differences in driving behaviours according to the BYNDS were also evident during the Learner period, acting as a quasi-validation of the clustering results. That is, the significant differences apparent between the three risk groups during the Provisional phase which were then found to be apparent even during the Learner licence phase, suggests that young drivers can be aggregated according to driving risk in a consistent fashion across the

two driver's licence periods. Interestingly, this is even in the context of the highly-moderated nature of the Learner licence phase as a result of the presence of a driving supervisor. Further, whilst there were modest differences in the self-reported fixed violations and risky driving exposure, there were considerable differences between the three groups of drivers according to transient violations including speeding in particular, misjudgement, and driving in response to mood, with the high-risk drivers reporting considerably more risky behaviours than the two remaining clusters and the low-risk group. Such over-involvement in risky driving behaviour is further reflected in the substantially higher crash involvement reported by the high-risk drivers during the Learner period.

Over-involvement in crashes by the high-risk drivers appeared to continue through the first six months of the P1 period. A substantially larger proportion of the high-risk drivers also reported being detected for an offence in this time, and engaged in punishment avoidance by actively talking themselves out of a ticket after detection. The pattern of self-reported risky driving behaviour for each group of novice drivers persisted from the Learner period through the first six months of the P1 period; and in general the high-risk drivers reported more risky driving behaviours at greater rates than the other two groups.

The P1 BYNDS scores were significantly higher than the Learner scores for the high-risk group of novice drivers, confirming their driving behaviour became significantly more risky when they were able to drive independently ($p < .001$ for all scales except for misjudgement: $p < .05$). For the medium-risk group, self-reported driving behaviours also became more risky upon independent licensure ($p < .001$ for all scales); except for fixed violations which remained relatively stable ($p = .45$); and driving misjudgement, which decreased slightly ($p < .05$). For the low-risk group, involvement in speeding increased slightly ($p < .05$); transient and fixed violations, and risky driving exposure remained relatively constant ($p = .48$, $p = .45$, $p < .05$ respectively); whilst driving in response to their

mood, misjudgement, and the composite BYNDS score decreased significantly between licence periods ($p < .05$, $p < .001$, $p < .01$ respectively). The self-reported patterns of driving behaviour over time for the drivers in the low-risk group are in stark contrast to the self-reported behaviours of the drivers in the high-risk group. The 44 items comprising the BYNDS were also examined for each group in the P1 period, and as expected every item was substantially higher on average for the high-risk group of drivers (all at $p < .001$) (see Table 3).

[Insert Table 3]

The young novice drivers also appeared to have some insight into the risky nature of their self-reported driving behaviour. Perhaps unsurprisingly, the high-risk group reported that bending rules was *less* dangerous than the other two groups (Table 4). The high-risk group also reported that their driving was less safe and more risky than the other two groups. The high-risk group reported considerably greater likelihood of bending, and intentions to bend, the road rules in their future driving. This group of young novice drivers also reported greater willingness to speed when they carried their friends as their passengers.

[Insert Table 4 here]

4.   Discussion

Young drivers continue to be overrepresented in road crash, injury and fatality statistics, suggesting that interventions targeting particular groups of young novice drivers may be required in addition to broad countermeasures such as GDL. The findings of this study suggest that specific risky behaviours, such as pre-Licence driving, unsupervised Learner driving, recording of extra hours – that is, hours not actually driven – in logbooks, and involvement in a crash as a Learner driver could be an early indicator that the novice driver may actually be a problem young driver. Once an independent driver, it appears that the risky behaviour of the problem young drivers is further evidenced by greater crash and

offence involvement. At this point it is noteworthy that reliance upon crash-involvement is problematic due to the multitude of variables which influence whether the driver crashes or not (Evans, 1991). Similarly,dependence upon offence detection is problematic due to enforcement constraints and the many opportunities drivers experience to offend without being detected. Notwithstanding these caveats, however, the considerable differences in the self-reported crash and offence involvement rates amongst the young novice drivers in the three risk groupings suggests that these negative outcomes are a good indicator of a potential problem young driver.

The next stumbling block to addressing the problem young driver is *what* to do with them, and *when* to intervene, once they have been identified. The research has identified a noteworthy group of problem young drivers – 13% of the young driver participants, almost double that of Vassallo et al. (2007). Existing countermeasures such as Queensland's enhanced-GDL program which targets novice drivers throughout the Learner and intermediate periods of licensure do not appear to be reaching these drivers, or if they are, they do not appear to be having the desired effect upon their driving behaviour. Driving on the road before licensed, and driving unsupervised as a Learner, are highly risky behaviours not only for the young driver but for all those who share the road with them. Whilst research consistently reveals that younger age is associated with greater risk among novice drivers, the social and political unacceptability of systemic measures such as raising the independent driving age may impede its adoption. It is noteworthy that one Australian state – Victoria – has historically had an 18-year minimum age limit for obtaining an unrestricted licence (VicRoads, 2011). As expected, the crash-involvement rate of 17 year old drivers is considerably lower in that state than in Queensland. Queensland may similarly benefit from such a change; however mobility considerations need to be more fully considered as the geography and population distribution of each state are dissimilar and transportation

alternatives such as public transport are not widely available in Queensland. Alternatively, targeted interventions should be considered for implementation during the pre-Licence, Learner, and P1 licence specifically targeting these problem young drivers. Such interventions can be operationalised within the context of broader countermeasures, such as GDL.

The riskiest drivers reported that their driving behaviour was indeed risky; therefore education campaigns that point out the risks associated with such behaviour are unlikely to be effective (e.g., Ulleberg, 2002). In addition, the nature of adolescence itself – such as developing identity, testing boundaries, and pervasive optimism bias – places the adolescent not only at greater risk (eg., see Elvik, 2010), but considerably influences the nature of and their receptiveness to road safety-specific and more broad- injury prevention interventions. As such, a range of interventions appear to be required (Williams, 2006). These countermeasures could include psychosocial interventions which can address psychological distress experienced as anxiety and depression (e.g., Scott-Parker et al., 2011a); resilience training (Senserrick et al., 2009), for example to help the novice develop skills to resist the impulse to drive in a risky way or to give in to peer pressure to be risky whilst carrying friends as passengers; brief interventions which highlight the relationship between impulsivity, sensation seeking and speeding in particular (e.g., Paaver et al., 2012); and implementation of in-vehicle technology such as intelligent speed adaptation devices (e.g., Lahrmann et al., 2012) or alcohol-ignition interlocks (e.g.,Willis et al., 2004).

Parents are also pivotal in the learning-to-drive process (Simons-Morton et al., 2008), from providing most of the in-car instruction for the Learner (Scott-Parker, Bates et al., 2011), to administering rewards and sanctions for the novice's driving behaviours (Scott-Parker et al., 2012c). Parents can also monitor car use during the pre-Licence and Learner periods, and should be encouraged to *actively* supervise and therefore monitor general and

GDL-specific road rule compliance during the Learner period (Saville, 2008; Scott-Parker et al., 2012d), with more parental monitoring associated with less risky driving behaviour of the young novice (Prato et al., 2010). Sharing the family vehicle rather than independent vehicle ownership can be protective and is associated with less risky driving behaviour (e.g., Camissa et al., 1999; Garcia-Espana et al., 2009; Scott-Parker et al., 2011b; Williams et al., 2006), highlighting the potential for a broad intervention which discourages novices from having unlimited exclusive access to a vehicle in the earliest stages of independent driving.

Interestingly a significantly larger proportion of highest-risk drivers were employed full-time and these drivers may be expected to have greater driving exposure associated with commuting to and from places of employment. As such, exposure-reduction measures (Crettenden, 1994), for example increasing the attractiveness of alternative transport options through significantly-reduced public transport fares which could have a flow-on effect, thereby removing opportunities to *be* problem young drivers, may be effective in reducing their on-road risk. Workplace interventions such as driving agreements (e.g., Saville, 2008) also warrant further consideration. Further, research consistently highlights the influence of sensation seeking propensity upon risky driving behaviour (see Jonah, 1997 for a review) and similar findings regarding the influence of reward sensitivity (Scott-Parker et al., 2012b) suggest that interventions begin to consider how to reduce rewards and sensation seeking opportunities for the risky young driver. This is particularly the case for the younger driver who is employed fulltime and as such has the financial capacity to engage in normatively-risky behaviour in an unforgiving road environment.

The research had a number of strengths and limitations. The research operationalised a longitudinal, self-report methodology using reliable instruments. Whilst self-report has been criticised as vulnerable to biases such as recall errors (which may lead to under-reporting of risky behaviours, crashes and offences) and impression management (which may contribute

to over-reporting of risky behaviours, crashes and offences if the participant believes that such behaviour is normative for their social group) (e.g., see Lajunen and Summala, 2003), the anonymity of the online survey and the high report of risky driving behaviours including driving after drinking suggest that their responses were not unduly influenced. Further, recent cohort research in New South Wales reported a high correlation between self-reported offences and crashes and official records (Boufous et al., 2009). Most importantly, information regarding many personal characteristics (e.g., depression, sensation seeking propensity) and driving behaviours (e.g., driving when tired, driving when influenced by their emotions) cannot be accessed via alternative means.

Importantly, some of the previous research (e.g., undertaken within the Australian context, Kleisen, 2011; Vassallo et al., 2007) has clustered drivers with both Learner and Provisional licences within the same groups. This is problematic not only as the Learner has less experience driving on the road and no independent driving experience, but also because the behaviour of Learners are likely to be moderated by the supervisor and not a true reflection of their driving behaviour. By comparison, the present research only used data gathered six months after commencement of independent driving to identify the different subgroups of risky drivers.

It should be noted however that whilst research findings pertaining to the participants have also been published elsewhere (e.g., Scott-Parker et al., 2012d, 2013), the participants may not reflect the characteristics, behaviours and attitudes of the general novice driver population of Queensland. The Learner Survey had a low overall response rate and the Provisional Survey had a high attrition rate. Whilst many variables are likely to affect response and attrition rates, some of this attrition may in part be attributable to Queensland's extreme weather conditions during the follow-up period (AAP, 2011). It is possible that only the most-compliant novice drivers participated in both surveys, and as such the suggested

magnitude of the young driver problem may well have been an underestimate. Further, in Queensland in 2009, 49% of Learners were female, compared to 60.6% of Learners in the first survey, with greater gender disparity occurring in the second survey. As a result, given the small sample of males, separate cluster analyses for each gender were not conducted. Interestingly, in contrast to earlier research which reported a greater proportion of males in the highest-risk cluster of drivers (e.g., Vassallo et al., 2007), males were relatively equally-represented in each cluster. This requires further investigation in a larger sample of novice drivers.

Additional research is required to determine the ability of the indicators such as pre-licence driving, unsupervised driving, and high BYNDS scores to differentiate between young novice drivers at high- and low-risk of injury in a road crash. Future research could also examine the characteristics and behaviours of the highest-risk young drivers by traffic offence type and crash-culpability (Wundersitz, 2007). This may result in more effective interventions targeting sub-groups of young drivers. In addition, males consistently emerge in the literature as more risky, more crash-involved drivers. Therefore recruitment of a larger sample of drivers and males in particular, and subsequent separate cluster analyses for each gender, may reveal avenues of gender-specific interventions.

5.   Conclusions

The issue of the young driver problem has been well-established in the literature, and a wealth of countermeasures targeting this driving cohort has been developed, implemented, and some have been evaluated. To date, GDL appears to be the most successful of these; however young drivers persist in their overrepresentation in crashes, and the injuries and fatalities arising from these. The problem young driver concept similarly has been well-established in the literature; however there has been limited research and policy development in the area. Principally this has been because of operational difficulties, particularly the lack

of effective criteria to identify the problem young driver. Following on from this, there is a dearth of interventions which can effectively address the increased risks posed by this group of young drivers.

To answer the question *who is the problem young driver?* posed initially, cluster analysis was performed using the responses of 378 drivers. This analysis yielded three clusters of drivers, ranging from lowest- to highest-risk. The highest-risk drivers were identified as those reporting considerably greater anxiety and depression, reward sensitivity and sensation seeking propensity. A substantially larger proportion of the highest-risk drivers reported engaging in pre-Licence driving, unsupervised Learner driving, submitting inaccurate logbooks, being involved in a crash as a Learner and P1 driver, and being detected for an offence and talking their way out of a ticket as a P1 driver. The highest-risk drivers also reported considerably more on-road risky driving behaviours like speeding, and more risky attitudes towards driving in general. Further research is required to verify the usability and accuracy of identification criterion such as pre-Licence driving, and a multi-faceted countermeasure approach from pre-licensure to the Provisional period appears to be required.Although the likely nature and utility of countermeasures targeting high risk young drivers remains unclear, the need to further enhance the safety of novice drivers highlights the necessity of further research and development in this area.

Footnotes

[1] It is noteworthy that GDL in the Queensland-context does not have a 'wait-out' option as such, in contrast to the majority of GDL programs in the North American context which have a finite age limit. Whilst a few concessions are made for drivers aged over 25 years (herein referred to as 'older drivers') who have a Learner licence (principally the 100-hour logbook requirement is a *voluntary* component rather than a *compulsory* requirement), older drivers must hold their Learner licence and their Provisional 1 licence each for a minimum of 1 year, which is exactly the same requirement as for younger drivers. A time concession for the Provisional 2 licence phase is granted to older drivers, such that rather than holding this licence for a minimum two year period before advancing to an unrestricted Open licence, older drivers hold their Provisional 2 licence for a one year period. Accordingly Queensland's GDL is unlikely to lead to a 'delay in risk' which has been identified in some jurisdictions in the United States (e.g., see Males, 2007).

[2] Pilot research (preliminary small group interviews, unpublished, which informed the research of Scott-Parker et al., 2009) which explored young novice drivers' meanings regarding not following road rules, found that young novice drivers reported that they frequently 'bent the road rules' (e.g. driving at 5 km/hr above the posted speed limit), and infrequently 'broke the road rules' (e.g., driving through a red light). Therefore to ensure that the young novice drivers responded to items regarding *all* transgressions of the road rules, the term 'bending the road rules' operationalised as "any time you did not follow the road rules completely, and includes things like going over the speed limit by any amount or reading a text on your mobile while you are driving" was used in the present research.

[3] The BYNDS was developed in response to an identified need for a young driver specific self-report instrument. The items in the scale measure behaviours only (it was noted that on occasion items in other scales combined behaviours and other variables, such as intentions or

motivations, thereby making them unsuitable as a behavioural measure); the items were designed to measure behaviours that appear particularly relevant to the increased risk experienced by all young drivers (such as driving inexperience captured within the subscale of misjudgements, and risky driving exposure evidenced as driving at night and with friends as passengers). In addition to the apparent face validity of the BYNDS, it is highly internally consistent (see Scott-Parker et al., 2010).

Acknowledgements

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Table 1

Description of the scales used to explore self-reported behaviours and personal characteristics.

Scale	*n*	Scale
Personal characteristics		
Anxiety	4	1 = *none of the time*, 5 = *all of the time*
Depression	6	1 = *none of the time*, 5 = *all of the time*
Reward sensitivity	11	1 = *no*, 2 = *yes*
Sensation seeking	8	1 = *strongly disagree*, 5 = *strongly agree*
Attitudes		
Dangerousness of risky driving	1	1 = *very dangerous*, 5 = *not at all dangerous*
Self-assessment as safe driver	1	1 = *not very safe*, 7 = *very safe*
Self-assessment as risky driver	1	1 = *never risky*, 7 = *always risky*
Likelihood of bending road rules	1	1 = *very unlikely*, 7 = *very likely*
Intentions to bend road rules	1	1 = *definitely will not*, 7 = *definitely will*
Willingness to speed[*]	1	1 = *very unwilling*, 7 = *very willing*
Driving behaviours		
BYNDS composite	44	1 = *never*, 5 = *nearly all the time*
Transient violations	13	1 = *never*, 5 = *nearly all the time*
Fixed violations	10	1 = *never*, 5 = *nearly all the time*
Misjudgement	9	1 = *never*, 5 = *nearly all the time*
Risky driving exposure	9	1 = *never*, 5 = *nearly all the time*
Driver mood	3	1 = *never*, 5 = *nearly all the time*
Speeding subscale	6	1 = *never*, 5 = *nearly all the time*

[*] Willingness to speed was a composite of 3 items exploring the young novice driver's willingness to drive in excess of speed limits (*go a little bit faster*, *go a fair bit faster*, *go a lot faster* if "you are driving at the speed limit with your friends in the car. You can't see any police or cameras around. Your friends suggest you drive faster. What are you willing to do in this situation?").

Table 2

Self-reported personal characteristics and driving behaviours in the pre-Licence, Learner and

Provisional phases.

Self-reported behaviours/ characteristics	Cluster			
	One	Two	Three	
	High Risk	Medium Risk	Low Risk	Significance
	(49 drivers)	(163 drivers)	(166 drivers)	p
Personal characteristics				
Gender (Male) [1,2]	34.7%	29.4%	28.9%	= .73[*]
Age (M, (SD)) [1]	17.5 (1.1)	17.8 (1.4)	18.1 (1.6)	< .05[**]
Studying (Full-time) [2]	49.0%	51.5%	50.6%	= .50[*]
Employed (Full-time) [2]	26.5%	14.7%	13.3%	< .01[*]
Car owner [2]	85.7%	81.6%	76.5%	= .29[*]
Reside in urban area [2]	65.3%	66.7%	57.0%	= .17[*]
Anxiety (M, (SD)) [2]	8.4 (2.8)	7.1 (2.6)	6.5 (2.5)	< .001[**]
Depression (M, (SD)) [2]	12.8 (5.0)	10.2 (4.2)	9.8 (4.2)	< .001[**]
Reward sensitivity (M, (SD)) [2]	5.3 (2.6)	3.9 (2.2)	2.4 (2.0)	< .001[**]
Sensation seeking (M, (SD)) [2]	25.1 (6.3)	23.5 (6.1)	19.4 (5.9)	< .001[**]
Driving behaviours: pre-Licence and Learner phase [1]				
Pre-Licence driving	22.4%	13.5%	8.4%	< .05[*]
Inaccurate logbook	36.7%	20.9%	9.0%	< .001[*]
Unsupervised driving	18.4%	14.1%	6.0%	< .05[*]
Crashed car	10.2%	1.8%	3.0%	< .05[*]
Offence detected	2.0%	3.7%	1.8%	= .55[*]
BYNDS composite	78.3 (13.0)	71.7 (8.7)	65.6 (6.9)	< .001[**]
Transient violations	23.9 (6.0)	20.8 (4.7)	17.8 (3.2)	< .001[**]
Fixed violations	10.6 (1.1)	10.4 (0.9)	10.1 (0.5)	< .001[**]

Misjudgement	15.0 (3.6)	13.4 (3.0)	12.4 (2.6)	$< .001^{**}$
Risky driving exposure	22.6 (4.8)	22.2 (3.8)	21.1 (3.2)	$< .001^{**}$
Driver mood	6.1 (2.7)	4.9 (2.0)	4.2 (1.5)	$< .001^{**}$
Speeding subscale	11.3 (4.0)	9.4 (2.9)	7.7 (1.7)	$< .001^{**}$

Driving behaviours: Provisional 1 phase [2]

Crashed car	26.5%	11.1%	3.0%	$< .001^{*}$
Offence detected	28.6%	12.9%	5.4%	$< .001^{*}$
Talked way out of ticket	16.3%	2.5%	1.8%	$< .001^{*}$
BYNDS composite	103.7 (11.9)	79.7 (6.7)	63.9 (6.2)	$< .001^{**}$
Transient violations	34.4 (8.0)	24.0 (5.5)	17.6 (2.9)	$< .001^{**}$
Fixed violations	12.9 (4.0)	10.4 (0.8)	10.1 (0.4)	$< .001^{**}$
Misjudgement	16.4 (3.6)	12.8 (2.2)	10.4 (1.3)	$< .001^{**}$
Risky driving exposure	31.4 (4.3)	26.7 (3.8)	21.8 (4.0)	$< .001^{**}$
Driver mood	8.7 (2.3)	5.7 (2.0)	3.9 (1.2)	$< .001^{**}$
Speeding subscale	16.5 (4.6)	11.3 (3.6)	8.0 (1.9)	$< .001^{**}$

[1] Responses collected in Learner Survey (survey one examining pre-Licence and Learner period).
[2] Responses collected in Provisional Survey (survey two examining first six months of P1 period).
[*] Analyses utilised Chi-square tests.
[**] Analyses utilised Analysis of variance.

Table 3

The items within the subscales of the Behaviour of Young Novice Drivers (BYNDS) and their mean and standard deviation for each cluster.

Items	Cluster		
	One	Two	Three
	High Risk	Medium Risk	Low Risk
	n = 49	*n* = 163	*n* = 166
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Transient Violations			
You drove over the speed limit in areas where it was unlikely there was a radar or speed camera	3.0 (1.0)	2.1 (0.9)	1.4 (0.5)
You went 10-20 km/hr over the speed limit (eg 72 km/hr in a 60 km/hr zone, 112 km/hr in a 100 km/hr zone)	2.8 (1.1)	1.9 (0.9)	1.3 (0.5)
You deliberately sped when overtaking	3.2 (1.1)	2.1 (1.0)	1.4 (0.6)
You sped at night on roads that were not well lit	2.2 (0.9)	1.4 (0.6)	1.1 (0.3)
You went up to 10 km/hr over the speed limit (eg 65 km/hr in a 60 km/hr zone, 105 km/hr in a 100 km/hr zone)	3.2 (0.9)	2.4 (0.9)	1.8 (0.7)
You went more than 20 km/hr over the speed limit (eg 60 km/hr in a 40 km.hr zone, 120 km/hr in a 100 km/hr zone)	2.1 (1.0)	1.3 (0.7)	1.0 (0.2)
You raced out of an intersection when the light went green	2.7 (1.1)	2.0 (0.9)	1.3 (0.6)
You travelled in the right lane on multi-lane highways	3.1 (1.2)	2.2 (1.0)	1.7 (0.8)
You sped up when the lights went yellow	3.1 (1.0)	2.1 (0.8)	1.7 (0.7)
You went too fast around a corner	2.7 (0.9)	1.9 (0.6)	1.4 (0.6)
You did an illegal U-turn	1.8 (0.9)	1.4 (0.6)	1.1 (0.3)
You overtook someone on the left	2.4 (1.1)	1.7 (0.9)	1.2 (0.5)
You spoke on a mobile that you held in your hands	2.3 (1.2)	1.4 (0.6)	1.1 (0.4)
Fixed Violations			
Your passengers didn't wear seatbelts	1.2 (0.7)	1.0 (0.3)	1.0 (0.0)
You drove after taking an illicit drug such as marijuana or ecstasy	1.2 (0.6)	1.0 (0.1)	1.0 (0.0)
You carried more passengers than could legally fit in your car	1.3 (0.7)	1.1 (0.3)	1.0 (0.1)
You didn't always wear your seatbelt	1.4 (0.9)	1.0 (0.1)	1.0 (0.0)
You drove without a valid licence as because you hadn't applied for one yet or it had been suspended	1.1 (0.5)	1.0 (0.0)	1.0 (0.0)
You didn't wear a seatbelt if it was only for a short trip	1.3 (0.6)	1.0 (0.1)	1.0 (0.1)
If there was no red light camera, you drove through intersections on a red light	1.4 (0.8)	1.0 (0.1)	1.0 (0.0)
You carried more passengers than there were seatbelts for in your car	1.2 (0.6)	1.0 (0.2)	1.0 (0.0)
You drove when you thought you may have been over the legal alcohol limit	1.5 (0.8)	1.1 (0.3)	1.1 (0.2)
You drove a high-powered vehicle	1.3 (0.7)	1.1 (0.3)	1.0 (0.3)
Misjudgements			
You misjudged the speed when you were exiting a main road	1.9 (0.7)	1.3 (0.5)	1.1 (0.2)

You misjudged the speed of an oncoming vehicle	1.7 (0.7)	1.4 (0.6)	1.2 (0.4)
You misjudged the gap when you were turning right	1.6 (0.8)	1.3 (0.5)	1.0 (0.2)
You misjudged the stopping distance you needed	2.1 (0.8)	1.5 (0.6)	1.2 (0.4)
You turned right into the path of another vehicle	1.5 (0.7)	1.2 (0.4)	1.0 (0.2)
You misjudged the gap when you were overtaking another vehicle	1.6 (0.7)	1.2 (0.4)	1.0 (0.1)
You missed your exit or turn	2.5 (1.0)	2.1 (0.8)	1.7 (0.7)
You entered the road in front of another vehicle	1.8 (0.7)	1.5 (0.6)	1.1 (0.4)
You didn't always indicate when you were changing lanes	1.9 (1.1)	1.4 (0.8)	1.2 (0.6)
Risky Exposure			
You drove on the weekend	4.2 (0.9)	4.1 (0.8)	3.6 (1.0)
You drove in the rain	3.7 (0.8)	3.3 (0.7)	2.9 (0.6)
You drove at peak times in the morning and afternoon	3.9 (1.0)	3.2 (1.0)	2.7 (0.8)
You drove at night	4.0 (0.8)	3.6 (0.9)	3.1 (0.9)
You drove at dusk or dawn	3.5 (1.0)	2.9 (1.0)	2.5 (1.0)
You carried your friends as passengers at night	3.1 (0.9)	2.5 (0.9)	1.8 (0.8)
You drove when you knew you were tired	3.1 (0.8)	2.3 (0.8)	1.8 (0.7)
Your car was full of your friends as passengers	2.8 (1.0)	2.2 (1.0)	1.6 (0.8)
You went for a drive with your mates giving you directions to where they wanted to go	3.0 (1.0)	2.4 (1.0)	1.8 (0.9)
Driver Mood			
Your driving was affected by negative emotions like anger or frustration	3.0 (1.0)	1.9 (0.7)	1.3 (0.5)
You allowed your driving style to be influenced by what mood you were in	2.8 (1.0)	2.0 (0.7)	1.4 (0.5)
You drove faster if you were in a bad mood	2.9 (0.9)	1.8 (0.8)	1.2 (0.4)

Adapted from Scott-Parker, Watson, & King, 2010.

The mean and standard deviations were calculated using the raw data in PASW 18.0.

Every item differs significantly at $p < .001$ across the three clusters.

Table 4

Self-reported attitudes and driving intentions.

	Cluster		
	One	Two	Three
Measure	High Risk	Medium Risk	Low Risk
	$n = 49$	$n = 163$	$n = 166$
Dangerousness of risky driving	2.4 (1.1)	2.0 (1.0)	1.6 (0.8)
Self-assessment as safe driver	4.2 (1.4)	5.0 (1.3)	5.4 (1.2)
Self-assessment as risky driver	3.8 (1.4)	2.4 (1.1)	1.9 (1.0)
Likelihood of bending road rules	4.7 (1.5)	3.6 (1.8)	2.3 (1.4)
Intentions of bending road rules	4.1 (1.6)	3.1 (1.6)	1.8 (1.2)
Willingness to speed	9.9 (4.2)	6.8 (3.6)	4.9 (3.8)

Note. All constructs were measured in the Provisional survey. Analyses utilised analysis of variance.
There were significant differences across the three clusters at $p < .001$ on every item.
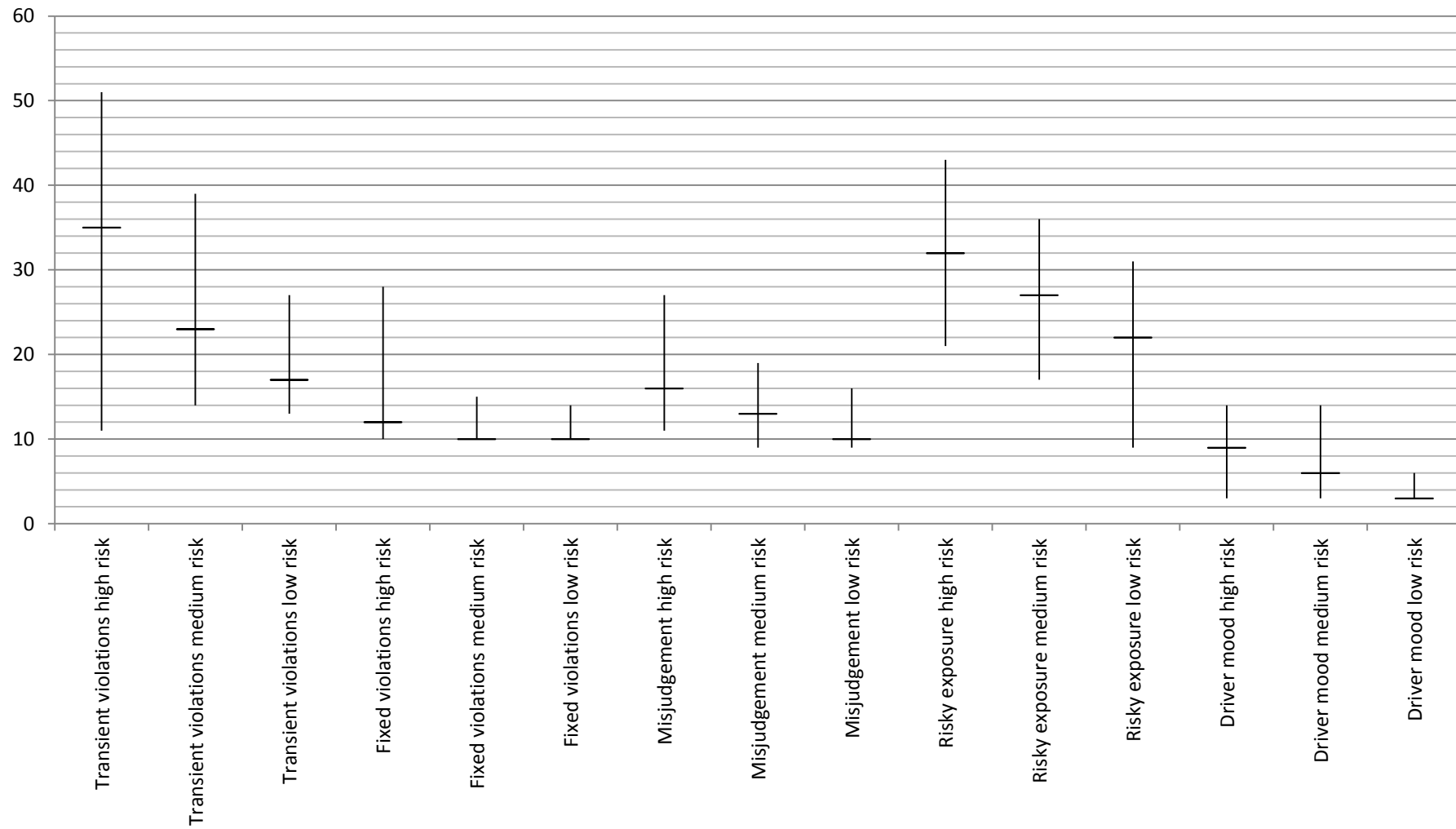
Figure 1.

Minimum, maximum and median scores for each of the five BYNDS subscales by cluster number.