Driver prototypes and behavioral willingness: Young driver risk perception and reported engagement in risky driving

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The authors declare no competing or conflict of interest arising from the publication of this article.

Citation: Harbeck, E. L., & Glendon, A. I. (2018). Driver prototypes and behavioral willingness: young driver risk perception and reported engagement in risky driving. *Journal of Safety Research*, *66*, 195-204. https://doi.org/10.1016/j.jsr.2018.07.009

Abstract

Introduction: This study aimed to explore perceived risk and reported willingness to engage in risky driving in a sample of young Australian drivers. The study also considered the influence of gender, driving experience, and risky driver prototypes on willingness to engage in risky driving. Within this context, a prototype is a social image of the type of person who engages in specific risk behaviors. In the prototype willingness model (PWM), willingness accounts for motivations that do not directly rely on planning or goal formation.

Method: The PWM was applied to a sample of 554 drivers (aged 17-25 years) to explore how risky driver prototypes: similarity (extent of identification with the prototype), favorability (how positive is the image), and behavioral willingness, may influence their perceived risk and reported engagement in risky driving behaviors. Drivers holding an Australian driver's license (Provisional 1, Provisional 2, or Open) anonymously completed an online survey measuring: 1) driver prototypes and behavioral willingness to engage in risky driving behaviors, 2) perceived risk of driving-related behaviors, and 3) the Behavior of Young Novice Drivers Scale transient and fixed violations subscales.

Results: Path analysis explored relationships between prototypes and willingness variables, perceived risk, and reported driving engagement. Goodness-of-fit statistics supported the conceptual model. Behavioral willingness showed the strongest relationship with perceived risk (negative) and reported driving violation engagement (positive).

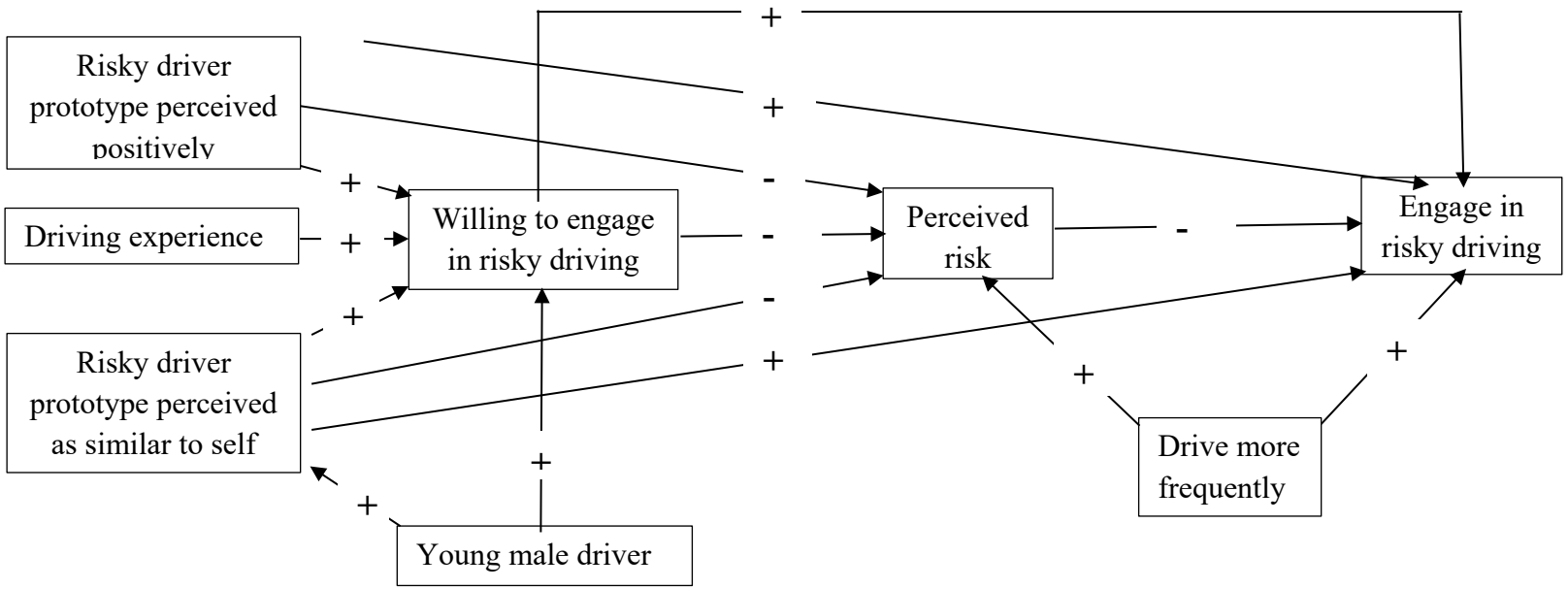
Conclusions: Risky driver prototypes and behavioral willingness, as well as driver's sex and driving experience, may help to explain individual differences in perceived risk, and young driver reported risky driving engagement.

Practical Applications: Identifying relevant factors that could be amenable to change, such as driver prototype and willingness variables, may contribute to improved road safety

initiatives, and provide information and support to counter factors that might otherwise facilitate young drivers' risk perceptions and risky driving engagement.

Graphical abstract

Summary of variables predicting young driver reported engagement in risky driving



+ = positive association; **-** = negative association

Driver prototypes and behavioral willingness: Young driver perceived risk and reported engagement in risky driving

1. Introduction

Typically over-represented in international road injury and death tolls (BITRE, 2017; WHO, 2013), while young drivers (aged 17-25 years) are 10-15% of licensed drivers, they and their passengers represent approximately 25% of Australian road deaths (ATC, 2011). A prominent explanation is their engagement in risky driving behaviors, such as the fatal five (speeding, drink-driving, seatbelt use, fatigued driving, distracted driving[1]), which inter alia, have been predicted by driving inexperience, poor risk perception, peer influence, and personality (Fernandes, Hatfield, & Job, 2010; Harbeck & Glendon, 2013; Hartos, Eitel, & Simons-Morton, 2001; Scott-Parker, Watson, King, & Hyde, 2012a).

Australian states have implemented graduated driver licensing (GDL) programs aimed at reducing novice drivers' motor vehicle crash involvement. Adopting a stepwise approach, these programs are designed to improve novice driver safety by extended supervision and driving experience over time (Scott-Parker, Bates, Watson, King, & Hyde, 2011; Williams & Shults, 2010). GDL programs typically involve a 3-stage approach: 1) learner period (minimum 1 year), 2) provisional license (minimum 2 years), and 3) open license. As well as adhering to all traffic and licensing regulations, GDL license holders must also conform with special restrictions and criteria at each stage (Williams & Shults, 2010). In 2007, the Queensland Government implemented a new GDL system (Learner, Provisional 1 – P1, Provisional 2 – P2, and Open License), which included introducing minimum age requirements for P2 and Open licenses of 18 and 20 years respectively[2]. For reviews of Australian GDL systems, see Senserrick (2009), and Scott-Parker and Rune (2016).

[1] See information on the fatal five from https://www.police.qld.gov.au/EventsandAlerts/campaigns/fatalfive.htm
[2] For Queensland State licensing criteria, see: http://www.tmr.qld.gov.au/licensing.aspx

A 17-year-old driver with a P1 license is four times more likely to be involved in a fatal crash than is a driver aged over 26 years (ATC, 2011). Compared with an older age group, drivers aged 16-24 years have reported higher engagement in risky driving (Jonah, 1990). In an 11-study review, it was reported that although novice 16-year-old drivers had higher crash fatality and injury risk rates than novice 17-year-old drivers did, there were no differences in crash rate between 17-year-old and 18-to-19-year-old novice drivers (McCartt, Mayhew, Braitman, Ferguson, & Simpson, 2009). The 17-19-year age range aligns with the transitional period from a P1 to P2 license in Australia. While evidence suggests that driving experience is more important than driver age for reducing crash risk, controlling for length of licensure McCartt et al. (2009) found that, compared with older drivers, particularly aged 25 and older, younger drivers still had consistently higher crash rates.

Regardless of age, inexperienced drivers detect hazards less holistically, more slowly, and less efficiently than more experienced drivers do, while underestimating traffic crash risk (Deery, 1999; Machin & Sankey, 2008; Wang, Zhang, & Salvendy, 2010). These findings were supported by McEvoy, Stevenson, and Woodward (2006), who demonstrated that lack of driving experience was a stronger predictor of crash risk or near-crash events than was driver age. However, Harbeck, Glendon, and Hine (2017) reported that driver age, rather than length of licensure, was associated with young driver perceived risk and reported engagement in risky driving, noting that a threshold effect may occur in young driver experience, regardless of age. What was unclear was whether differences between young driver license types (P1, P2, Open) occurred in their perception of risk and subsequent reported risky driving engagement, especially as open license drivers are considered experienced due to being older, with longer licensure, and more extensive driving experience.

1.1. Perceived risk

In traffic psychology, perceived risk is a subjective judgment about a specific risk's severity and characteristics (Deery, 1999), which can influence decision-based behaviors (e.g., speed selection). Perceived risk has been reported as being negatively associated with self-reported engagement in risky driving (Harbeck & Glendon, 2013; Harbeck et al., 2017; Machin & Sankey, 2008), although conflicting results have been found (e.g., Hatfield & Fernandes, 2009; Ivers et al., 2009; Ulleberg & Rundmo, 2003). As a predictor of risky driving engagement (Harbeck & Glendon, 2013; Rhodes & Pivik, 2011), perceived risk has been used in safety campaigns to promote young driver safety (Deery, 1999; Hassan & Abdel-Aty, 2013; Shope, 2006). Changes in perceived risk have been linked with comparisons being made between the self and an "other", often an unrealistic stereotype who engages in the risky behavior at a higher level than does the self (Thornton, Gibbons, & Gerrard, 2002). This may lead to a change in perceived personal vulnerability and increased engagement in the risky behavior. Such social influences have been modelled in the prototype willingness model (PWM) framework.

1.2. Prototype willingness model

Grounded in social learning theory, the PWM was created to improve the predictive value of health behavior theories that addressed youth decision making in risky health-related behaviors (Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008; Gibbons & Gerrard, 1995; Thornton et al., 2002). The PWM proposes that risky behavior may be engaged in impulsively in response to situations that generate risk. This impulsivity is relevant to young adults in the process of creating their identity, opinions, and values (Cestac, Paran, & Delhomme, 2011). Young adults are also considered more sensitive to social influences than are older adults (Gibbons & Gerrard, 1995; Todd, Kothe, Mullan, & Monds, 2016). The PWM has been

applied to understand a number of youth-engaged risky driving behaviors, including speeding, aggressive driving, substance use, distractions, moving violations, driving through flooded routes, and cell phone use (Cestac et al., 2011; Gibbons & Gerrard, 1995; Pearson & Hamilton, 2014; Rivis, Abraham, & Snook, 2011; Rozario, Lewis, & White, 2010; Schmidt, Morrongiello, & Colwell, 2014; Scott-Parker, Hyde, Watson, & King, 2013).

Prototype willingness is a modified dual-processing model represented by two decision-making paths: a reasoned path, and a social reaction path (for reviews, see Gerrard et al., 2008; Gibbons & Gerrard, 1995). The current study focuses on the second decision-making path, social reaction, which attempts to explain unplanned and unintended behaviors in certain situations (e.g., an unsupervised party where alcohol and drugs are available and having to drive home; Gerrard et al., 2008). This path contains two important factors, the risk image or prototype, and behavioral willingness.

Prototypes, or risk images, are the "…cognitive representations or social images of the type of person who engages in specific risk behaviors" (Gerrard et al., 2008, p. 36). Within the PWM these images represent a typology rather than a description of the physical appearance of the type of person (Gerrard et al., 2008; Gibbons & Gerrard, 1995). Two aspects of prototype perception influence risk decisions: prototype similarity, and prototype favorability (Gerrard et al., 2008; Rivis et al., 2011). These two aspects interact so that the more strongly a person identifies with a prototype (prototype similarity), the more positively the image is viewed (prototype favorability). The combination of these two aspects influences how willing a person is to engage in the behavior defined by the prototype image (e.g., safe or unsafe driver; Gerrard et al., 2008; Gibbons & Gerrard, 1995; Rivis et al., 2011). Changed engagement in risky behavior is thereby linked with changes in a person's favorability of prototype perception (positive = more engagement, negative = less engagement; Rivis et al., 2011; Thornton et al., 2002).

The more favorable the prototype, the more willing is the person to accept the social consequences associated with the behavior, for example, being seen by others as someone who engages in the behavior (Gerrard et al., 2008). In a study of risky driving in a U.S. university student sample, Gibbons and Gerrard (1995) found that perceptions of the typical "risky driver" prototype could predict changes in participants' self-reported engagement in risky driving. However, Rivis et al. (2011) found that prototype evaluation (positive or negative, through its interaction with prototype similarity) predicted older, but not younger, males' willingness to drink and drive. This finding might suggest that prototypes are more influential for youths' than for older peoples' risky behaviors (Gerrard et al., 2008; Rivis et al., 2011). Scott-Parker et al. (2013) also found evidence countering earlier research, such that prototypes and intentions did not significantly predict speeding for novice drivers. However, for females, greater willingness to speed as a learner driver did predict speeding as a provisional driver (Scott-Parker et al., 2013).

While a driver's intentions have been considered to be a good predictor of engaging in risky behaviors, especially when these are impulsive or socially undesirable, Gibbons and Gerrard (1995) argued that these behaviors are better measured by behavioral willingness, rather than intentions. Behavioral willingness has been defined as "…recognition that one would be willing to engage in the behavior under some circumstances" (Gibbons & Gerrard, 1997, p. 79). An individual's willingness accounts for motivations that do not directly rely on planning or goal formation, and although engaging in risky behaviors is usually volitional by youth (e.g., drag racing, drink-driving, illegal maneuvres), sometimes it is neither planned nor intentional (e.g., speeding, driving while distracted, tailgating; Gerrard et al., 2008; Gibbons & Gerrard, 1995; Rivis et al., 2011). Therefore, when compared with social-cognitive models (e.g., theory of planned behavior), as PWM accesses unintentional and unconscious,

unplanned, or non-goal-directed driving behaviors, it may provide insights as to why novice drivers elect to engage, or not engage, in risky driving behaviors on the spur of the moment.

While they are correlated, willingness has been shown to predict a number of risky behaviors independently of intention (Gerrard et al., 2008; Gibbons, Gerrard, Blanton, & Russell, 1998; Gibbons et al., 2004), and willingness is measured as a response to risk-related situations (Gerrard et al., 2008). PWM questionnaires describe a hypothetical scenario, where it is explained that no assumption is being made that the respondent would ever be in such a situation. Therefore, the hypothetical scenario allows the question to shift some of the focus of attention, attribution, and any bias that might influence a participant's answer, from their self to the specified situation (Gerrard et al., 2008; Gibbons et al., 1998). For example, in the situation of a novice driver's speeding, willingness to speed in the presence of peers may be a stronger predictor of speeding than the novice driver's intention to speed (Gerrard et al., 2008). A novice driver with a favorable prototype of a risky young driver makes it particularly likely that the novice driver will speed if the circumstances to do so arise (Scott-Parker et al., 2013).

1.3. The current study

The first aim of the study was to explore whether differences would occur within a sample of Australian drivers (aged 17-25 years, license type P1, P2, or Open) in their stated willingness to engage in the fatal five driving behaviors, perceived risk, and reported risky driving engagement. The study applied PWM predictors (driver prototypes and behavioral willingness) to this young driver sample, examining speeding and drink-driving, and expanding PWM's potential prediction power to include distraction, seatbelt use, and fatigue. As a second aim, the study also explored sex differences and driving experience in risky driver prototypes (similarity and favorability), and the influence that these variables might have on respondents' reported willingness to engage in risky driving.

We expected that some PWM variables (driver prototypes, behavioral willingness) would contribute to a conceptual framework that attempted to explain young drivers' perceived risk, and whether they chose to engage in risky driving behaviors, such as the fatal five. From the PWM literature, these hypotheses were proposed.

H1: Higher risky driver prototype favorability will predict: a) lower perceived risk of, and b) higher reported engagement in, risky driving behaviors; c) these relationships will be partially mediated by willingness to engage in risky driving behaviors.

H2: Higher risky driver prototype similarity will predict: a) lower perceived risk of, and b) higher reported engagement in, risky driving behaviors; c) these relationships will be partially mediated by willingness to engage in risky driving behaviors.

H3: Higher willingness to engage in risky driving behaviors will predict: a) lower perceived risk of, and b) higher engagement in, risky driving behaviors.

H4: Higher perceived risk will predict lower reported engagement in risky driving behaviors.

H5: Longer driving experience (length of licensure), and higher daily driving frequency will predict higher: a) stated willingness to engage in, and b) reported engagement in, risky driving behaviors.

H6: Compared with females, males will have higher: a) risky driver prototype favorability, b) willingness to engage in risky driving behaviors, and c) reported engagement in risky driving behaviors, and lower d) perceived risk.

2. Methodology

2.1. Participants

The sample comprised 554 Australian drivers (134 males, 24.2%) aged 17-25 years (M = 20.1, SD = 2.4). A majority (95.3%) of participants reported using a car as their vehicle for

transport, driving a mean of 208.6 km (*SD* = 171.5) per week. All held an Australian driver's license: 158 (28.5%) reporting holding a P1 license, 214 (38.6%) a P2 license, and 182 (32.9%) an Open (unrestricted) license. Participants were recruited via convenience sampling using online advertising (e.g., Facebook, email), and had the option to enter a prize draw to win one of three AUD$100 gift vouchers. Invited first-year psychology students who completed the survey using the online subject pool sign up also received course credit.

2.2. Measures

Participants completed an online questionnaire measuring PWM constructs: perceived risk of, and reported engagement in, risky driving behaviors, and reported their age, sex, license type, kilometers driven/week, and type of vehicle driven.

2.2.1. Prototype willingness model

Gibbons and Gerrard's (1995) PWM constructs were used to create items, representing: risky driver prototype favorability, risky driving prototype similarity, and behavioral willingness to engage in the fatal five.

2.2.1.1. Risky driver prototype favorability: Adjectives sourced from Gibbons and Gerrard (1995), and Scott-Parker et al. (2013), were used to derive 12 adjectives (6 positive: safe, cautious, aware of dangers, sensible, independent, considerate; and 6 negative: immature, irresponsible, show-off, careless, ignorant, self-centred), which were presented as statements. An illustrative item was: "A risky driver is immature". Participants indicated their level of agreement with each statement on a 7-point scale from: 1 *strongly disagree*, to 7 *strongly agree*. After reverse scoring responses to negative adjectives, scores were aggregated so that higher scores reflected a more favorable prototype.

2.2.1.2. Risky driver prototype similarity: Participants rated themselves on the same 12 adjectives described above on a 7-point scale from: 1 *strongly disagree*, to 7 *strongly agree*. An illustrative item was: "As a driver I consider myself to be cautious". An additional item

sought respondents' level of agreement for their self-perception of whether they considered themselves to be a risky driver (e.g., "As a driver I am very similar to the typical person who drives in a risky manner – e.g., exceeds speed limits, drives after consuming alcohol or while tired, does not use a seatbelt, talks on a handheld phone while driving"). After reverse scoring, total scores from the 13 items resulted in a comparable measure of participants' reported similarity to a risky driver prototype, with higher scores indicating higher risky driver prototype similarity.

2.2.1.3. Behavioral willingness: Sixteen items evaluated willingness to engage in driving behaviors related to the fatal five (3 speeding items, 3 drink-driving items, 2 seatbelt use items, 4 fatigue items, and 4 distraction items). Participants responded on a 7-point scale from: 1 *not willing at all*, to 7 *extremely willing*. After reverse scoring, aggregate scores resulted in a comparable measure of participants' reported behavioral willingness, with higher scores indicating higher willingness to engage in the fatal five driving behaviors.

2.2.2. Perceived risk

The nine items developed for the perceived risk of risky driving behaviors scale were based on risk perception scales created by Ivers et al. (2009), and by Machin and Sankey (2008). Items focused on cognitive aspects of risk perception: aversion to risk-taking (perceived danger) for the driving behavior. The 5-point response scale was from: 1 *not risky at all*, to 5 *very risky*. An initial 15 items were reduced through exploratory factor analysis to identify the best item pool that represented perceived risk of risky driving behaviors for this sample. The final nine items examined risky driving behaviors that encompassed the fatal five driver behaviors and included these other risky driving behaviors: mobile (cell) phone use, tailgating, unsafe overtaking, drug-driving, and illegal maneuvers (e.g., U-turns at prohibited intersections). Higher scores indicated higher perceived risk of risky driving behaviors.

2.2.3. Risky driving engagement

Scott-Parker, Watson, King, & Hyde's (2012b) revised Behavior of Young Novice Drivers Scale (BYNDS) measured risky driving engagement. The BYNDS uses a 5-point response format from: 1 *never*, to 5 *almost always*. Two BYNDS subscales were included: the transient violations (12 items), and fixed violations (6 items) subscales. This variable was named "Reported risky driving engagement" in the model to accurately reflect the measured construct. Higher scores indicated more self-reported risky driving engagement in the previous month of driving.

2.3. Procedure and design

After obtaining ethical approval from the authors' University Human Research Ethics Committee, an online survey tool was created in LimeSurvey v1.91, and the survey link was advertised using the University's e-news sheet Volunteer for Important Research Projects, and the authors' school's research participant pool. Drivers aged 17-25 holding an Australian driver's license were invited to participate. The survey was available online for five months, after which the response data file was downloaded and the data cleaned and coded.

A series of between-groups ANCOVAs was run to examine if license type differences occurred in the drivers' perceived risk, behavioral willingness and reported driving violation engagement. Covariates of the length of licensure and driving frequency (driver experience) were included in the three ANCOVAs. Alpha levels of .05 were used to determine statistical significance for the main analyses with a Bonferroni correction applied to determine significance when multiple comparisons between license types were run. Partial eta squared (η_ρ^2) was used as the measure of effect size using Cohen's rules of thumb, where η_ρ^2 threshold values of 0.01, 0.06, and 0.14 represent small, medium, and large effect sizes respectively (Cohen, 1988). Descriptive statistics are presented using unadjusted means and standard deviations.

License type, young driver perceived risk, and reported willingness to engage in risky driving behaviors were examined with item means and standard deviations. Driver sex, and driving frequency – measured by mean km/per month, PWM (risky driver prototype favorability/similarity, and behavioral willingness), perceived risk, and reported risky driving engagement distributions, were examined and strengths of association explored with correlations between variables using Pearson's correlation coefficient (r). We used r =.10, .30 and .50 to represent respectively weak, moderate, and strong associations (Cohen, 1988). As the variables of interest were derived from a theoretical model, and all were measured variables, path analysis was chosen for the primary analysis. Analyses used IBM SPSS v20.0, and IBM AMOS v22.0.

3. Results

3.1. Initial analyses

Prior to data analysis, distributions of all measured variables were examined. Normality violations were as expected, risky driver prototype favorability, prototype similarity, and reported risky driving reported engagement standardized skew statistics were significant and positively skewed above 2.58. As square root transformations on these variables produced no significant differences in the analyses after transformations, the raw data for all cases were retained for the analyses.

Descriptive statistics examining perceived risk, behavioral willingness item means, and standard deviations and driving violation reported engagement frequency are in tables 1-3. Between-participants ANCOVAs tested for license type differences in the sample. Table 1 reports responses to perceived risk, separated by license type (P1, P2, Open), to determine whether differences existed. After controlling for covariates of driver experience (length of licensure, driving frequency), similar responding was found across all license types, with no

difference between license type and perceived risk, $F(2,549) = 2.05$, $p = .130$. The highest risk-rated behavior was drink-driving, followed closely by driving without a seatbelt. The lowest rated risky driving behavior was speeding (driving 70km/hr in a 60km/hr zone), followed closely by driving distracted (behaviors that required either or both the driver's eyes to be off the road, and hands off the wheel).

Table 2 shows willingness ratings to engage in the fatal five driving behaviors. A between-participants ANCOVA compared the effect of license type on total reported behavioral willingness. After controlling for the covariates of driver experience (length of licensure, driving frequency), there was a significant effect of license type on reported behavioral willingness across the three license conditions, $F(2,549) = 6.54$, $p = .002$, $\eta_p^2 = .02$. Post hoc comparisons, adjusted using a Bonferroni correction, indicated that mean behavioral willingness for P1 drivers ($M = 53.80$, $SD = 14.48$) was significantly lower than the mean for both P2 ($M = 59.59$, $SD = 12.87$), and Open license drivers ($M = 63.10$, $SD = 13.92$). No difference was found between Open and P2 drivers' mean behavioral willingness scores. Across all license groups (P1, P2, Open), compared with drink-driving and not wearing a seatbelt, drivers reported high willingness to engage in speeding, distracted driving, and driving while fatigued.

Table 1.

Means and standard deviations for perceived risk items by license type (*N* = 554).

Perceived risk of risky driving behavior item	P1 drivers *n* = 158		P2 drivers *n* = 214		Open drivers *n* = 182		Total sample *N* = 554	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Driving a vehicle soon after having drunk alcohol and being *over* the legal BAC limit of .05	4.75	0.49	4.69	0.66	4.65	0.66	**4.69**	0.62
Driving a vehicle without having your seatbelt buckled up	4.28	0.92	4.31	0.90	4.27	0.93	**4.29**	0.92
Driving a vehicle while using a hand held cell phone	4.34	0.80	4.16	0.86	4.12	0.88	**4.20**	0.85
Overtaken a vehicle by crossing double white lines	4.14	0.93	4.25	0.91	4.18	0.96	**4.19**	0.93
Driving while closely following another vehicle (at less than 2 seconds distance)	4.18	0.74	4.00	0.89	4.06	0.85	**4.07**	0.84
Performed an illegal driving maneuvre (e.g., illegal U-turn, donut, burnout, drifting)	4.17	0.92	4.07	0.94	3.87	0.99	**4.03**	0.96
Driving while feeling tired or fatigued	4.11	0.87	3.93	0.90	4.05	0.89	**4.02**	0.89
Driving a vehicle while distracted (e.g., due to drinking, eating, smoking, changing a CD)	3.58	0.98	3.21	1.00	3.25	1.01	**3.33**	1.01
Driving at 70km/hr in a designated 60km/hr speed zone	2.94	0.94	2.92	1.02	2.90	1.11	**2.92**	1.03

Note: *M* = mean; *SD* = standard deviation; P1 = Provisional 1; P2 = Provisional 2; BAC = blood alcohol concentration; the response scale was from: 1 *not risky at all*, to 5 *very risky*

Table 2. *Means and standard deviations for behavioral willingness items* (*N* = 554).

Behavioral willingness of driving behavior	P1 drivers *n* = 158		P2 drivers *n* = 214		Open drivers *n* = 182		Total sample *N* = 554	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Speeding								
Exceed the designated speed limit at least once, but under 10km/hr	4.84	1.77	5.32	1.58	5.48	1.47	**5.23**	1.62
Overtake a slower vehicle by exceeding the designated speed limit	4.73	1.74	5.00	1.65	5.32	1.45	**5.03**	1.63
When deemed possible and or necessary, exceed the designated speed limit by more than 10km/hr	4.45	1.86	4.82	1.73	5.19	1.64	**4.84**	1.76
Drink-driving								
After a night of drinking drive home assuming your BAC is under the legal limit of .05	2.05	1.43	2.25	1.62	3.05	1.94	**2.45**	1.73
After a night of drinking call a taxi/cab instead of driving your own car home	1.97	1.22	2.31	1.41	2.29	1.32	**2.21**	1.33
Take the offer of riding home with a friend who you saw was also drinking at a party	1.75	1.42	2.12	1.81	2.45	1.82	**2.12**	1.73
Seatbelt use								
While driving pull over to a safe place and put your seatbelt on	2.55	1.89	2.66	1.82	3.04	2.06	**2.75**	1.93
While driving not have your seatbelt on	2.65	1.74	2.14	1.46	1.95	1.41	**2.22**	1.55
Fatigue								
Drive while feeling fatigued (tired)	4.58	1.75	4.88	1.60	5.03	1.61	**4.84**	1.65
Drive from a location (workplace, place of study, home, etc.) while feeling tired or physically fatigued	4.16	1.86	4.50	1.68	4.80	1.54	**4.50**	1.71
Drive after finishing a double shift (more than 10 hours) at your workplace	3.77	1.71	4.11	1.58	4.32	1.61	**4.08**	1.64
Drive the next morning after experiencing a poor (less than 4 hours) night of sleep	2.02	1.37	2.16	1.36	2.44	1.63	**2.21**	1.46
Distraction								
While driving change the CD/radio station you are listening to by hand	5.30	1.51	5.66	1.30	5.68	1.26	**5.56**	1.36
While driving answer and continue to talk on your mobile phone in your hand	4.36	1.82	4.92	1.49	5.23	1.46	**4.86**	1.62
While driving answer and continue to talk on your cell phone with a hands-free device	4.21	1.89	4.91	1.78	5.21	1.74	**4.81**	1.84
Drive a vehicle while distracted (e.g., due to drinking, eating, smoking)	3.55	1.72	4.23	1.64	4.25	1.68	**4.04**	1.70

Note: *M* = mean; *SD* = standard deviation; P1 = Provisional 1; P2 = Provisional 2; BAC = blood alcohol concentration; responses were on a 7-point scale from 1 *not willing at all*, to 7 *extremely willing*

Table 3 shows frequencies of whether participants reported engaging in each violation during the past month, using the BYNDS transient and fixed violation subscales. Although Table 3 is not split by license type for ease of interpretation, a between-participants ANCOVA compared effect of license type on total reported risky driving engagement across subscales. After controlling for covariates of driver experience (length of licensure, driving frequency), there was a main effect of license type for reported risky driving engagement for the three groups, $F(2,549) = 5.70$, $p = .004$, $\eta_\rho^2 = .02$. Post hoc comparisons, adjusted using a Bonferroni correction, indicated that mean reported engagement in risky driving behaviors for P1 drivers ($M = 14.75$, $SD = 8.36$) was significantly lower than that for P2 ($M = 17.36$, $SD = 8.92$), and for Open license drivers ($M = 19.06$, $SD = 9.38$). No difference was found between Open and P2 licensed drivers' reported risky driving engagement mean scores.

Table 3 shows that the most frequent transient violations reportedly engaged in during the previous month were speeding (speeding up when a traffic light changed to amber, and driving up to, or 10-20 km/hr over, the designated speed limit). For fixed violations, the most frequently reported driving behavior was running a red light if it was known that there was no intersection camera. The least frequently reported transient violation was overtaking another vehicle on the left (drivers keep left in Australia)[3], and for fixed violations, driving without a valid license.

[3] Not always a violation, depending upon road type and traffic conditions.

Table 3.
Frequency of reported driving violation engagement (BYNDS subscales; $N = 554$)

Item	*Never*	*Hardly ever*	*Sometimes*	*Often*	*Always*	***Total Sample***	
Transient violations	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	***M***	***SD***
Drove up to 10 km/hr over the speed limit	58 (10.5)	74 (13.4)	192 (34.7)	193 (34.8)	37 (6.7)	**2.14**	1.07
Drove over the speed limit in areas unlikely to have radar or speed camera	59 (10.6)	115 (20.8)	194 (35.0)	162 (29.2)	24 (4.3)	**1.96**	1.05
Travelled in the right-hand lane on a multi-lane highway	91 (16.4)	112 (20.2)	143 (25.8)	157 (28.3)	51 (9.2)	**1.94**	1.23
Deliberately speed when overtaking	73 (13.2)	127 (22.9)	160 (28.9)	164 (29.6)	30 (5.4)	**1.91**	1.12
Sped up when approaching a traffic light that turned to amber	57 (10.3)	141 (25.5)	204 (36.8)	123 (22.2)	29 (5.2)	**1.87**	1.04
Sped out of an intersection when the light went green	134 (24.2)	144 (26.0)	164 (29.6)	95 (17.1)	17 (3.1)	**1.49**	1.12
Drove 10-20 km/hr over the speed limit	132 (23.8)	177 (31.9)	135 (24.4)	95 (17.1)	15 (2.7)	**1.43**	1.11
Sped at night on roads that were not well lit	212 (38.3)	196 (35.4)	98 (17.7)	41 (7.4)	7 (1.3)	**0.98**	0.99
Did an illegal U-turn	252 (45.5)	177 (31.9)	94 (17.0)	26 (4.7)	5 (0.9)	**0.84**	0.93
Spoke on a hand-held cell phone	301 (54.3)	126 (22.7)	95 (17.1)	26 (4.7)	6 (1.1)	**0.75**	0.97
Drove more than 20 km/hr over the speed limit	300 (54.2)	170 (30.7)	57 (10.3)	22 (4.0)	2 (0.9)	**0.67**	0.88
Overtook someone on the left	368 (66.4)	122 (22.0)	46 (8.3)	16 (2.9)	2 (0.4)	**0.49**	0.80
Fixed violations							
If there was no red light camera, ran a red light	480 (86.6)	58 (10.5)	12 (2.2)	4 (0.7)	0 (0.0)	**0.17**	0.48
Drove after taking an illicit drug (e.g., marijuana, ecstasy)	511 (92.2)	30 (5.4)	8 (1.4)	2 (0.4)	3 (0.5)	**0.12**	0.47
Did not always wear your seatbelt	508 (91.7)	32 (5.8)	9 (1.6)	4 (0.7)	1 (0.2)	**0.12**	0.45
Carried more passengers than could legally fit in the car	496 (89.5)	49 (8.8)	8 (1.4)	1 (0.2)	0 (0.0)	**0.12**	0.38
Carried more passengers than there were seatbelts in car	508 (91.7)	35 (6.3)	9 (1.6)	1 (0.2)	1 (0.2)	**0.11**	0.40
Drove without a valid license	521 (94.0)	22 (4.0)	9 (1.6)	2 (0.4)	0 (0.0)	**0.08**	0.36

Note: *M* = mean; *SD* = standard deviation; the response scale was from: 0=*Never*, to 4=*Always*.

3.2. Correlations

Table 4 shows means, standard deviations, reliability coefficients, and zero-order correlations between variables. Due to the significant effect found for license type in the descriptives and analyses, length of licensure (in months) was substituted for license type as these variables were highly correlated (r = .76). The correlation between age and length of licensure was .86. Before model testing using path analysis, relationships between demographic variables (driver sex, driving frequency measured by mean kilometers driven/week, and length of licensure in months), PWM variables (risky driver prototype similarity/favorability, behavioral willingness), perceived risk, and reported driving engagement were examined.

As shown in Table 4, correlations between PWM variables and perceived risk were moderate, with higher prototype favorability, similarity, and behavioral willingness being negatively associated with perceived risk. Associations between PWM variables and reported risky driving engagement were positive. The strongest relationship was between behavioral willingness and reported risky driving engagement (r = .55). Though correlations were small, significant driver sex differences were found, when compared with females, males reported higher: risky driver prototype similarity, behavioral willingness, and risky driving engagement. Compared with males, females reported higher perceived risk. Length of licensure and driving frequency had significant positive relationships with behavioral willingness and reported risky driving engagement. Only relationships significant at $p < .05$ were entered as paths in the proposed model.

Table 4.

Means, standard deviations, reliability coefficients, and zero-order correlations between criterion and predictor variables (N = 554)

	M	*SD*	α	Driver sex	Length of licensure	Driving frequency	Risky driver prototype favorability	Risky driver prototype similarity	Behavioral willingness	Perceived risk
Length of licensure (months)	43.81	23.22	-	.07						
Driving frequency (mean km/week)	208.59	171.50	-	-.03	-.01					
Risky driver prototype favorability	26.95	11.29	.88	-.08	.02	-.04				
Risky driver prototype similarity	27.12	9.83	.88	-.17**	.06	.01	.50**			
Behavioral willingness	59.09	13.92	.86	-.14**	.21**	.14**	.27**	.28**		
Perceived risk	35.75	4.96	.79	.09*	-.05	- .01	- .40**	-.38**	-.42**	
Reported risky driving engagement	17.18	9.07	.88	-.09*	.11*	.11**	.37**	.46**	.55**	-.43**

Note: *$p < .05$, **$p < .001$

3.3. Path analysis

Measured variables were derived as described in the Method section. The model for testing was derived from the study's theoretical basis, described above. The proposed model included all predictor (risky driver prototype favorability and similarity), control (driver sex, length of licensure, driving frequency), mediating (behavioral willingness, perceived risk), and criterion (reported risky driving engagement) variables, with hypotheses represented as predicted paths. Applying the recommendations for minimum sample size required for path analysis, the current sample exceeded the 20 cases per variable ratio (Kline, 2011). To assess and compare the goodness-of-fit between the hypothesized and observed models, Hu and Bentler's (1999), and Byrne's (2001) recommended indices cut-off values for assessing fit were used (non-significant χ^2, normed $\chi^2 < 3$, AGFI and CFI > .90, RMSEA < .1). The fit statistics indicated that the data fitted the proposed model, χ^2 (df) = 11.79 (10), p = .304, Normed χ^2 = 1.17, SRMR = .025, AGFI = .982, CFI = .998, RMSEA = .018 (90% CIs .000, .051). The final recursive model is shown in Figure 1. Adding the direct and indirect (multiplied together) standardized path coefficients of the PWM and other variables explained 29% of the variance in perceived risk, while the overall model explained 42% of the variance in reported risky driving.

Although significant direct pathways existed between PWM variables and perceived risk, and between PWM variables and reported risky driving engagement, indirect pathways through behavioral willingness and perceived risk were present for the driver prototypes, indicating possible partial mediation. To test the strength of the respective mediating effects, bootstrapping procedures in AMOS were applied, specifying 1000 samples and bias-corrected confidence intervals of 95% (Cheung & Lau, 2008). The standardized indirect effect of risky

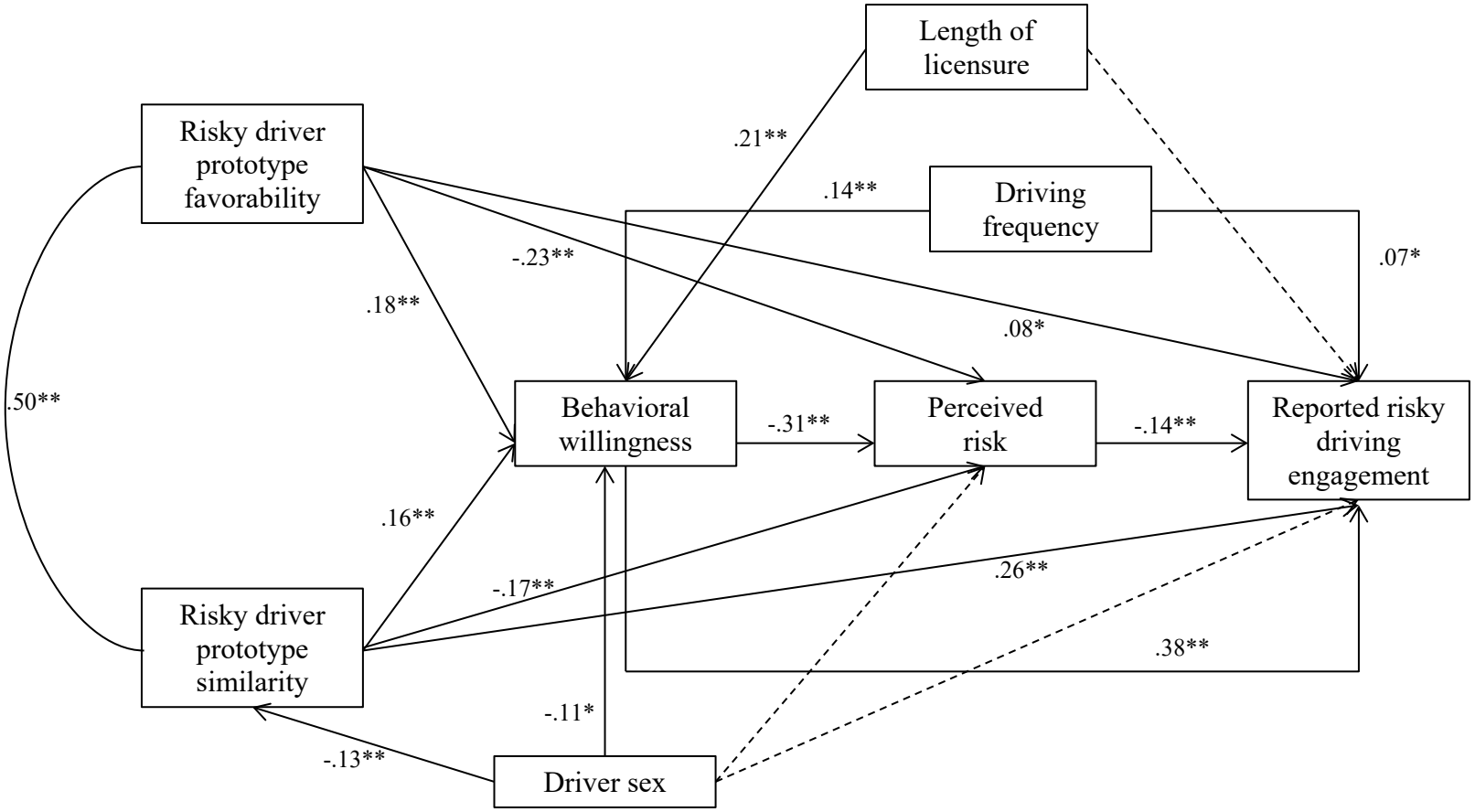


Figure 1. Path model showing relationships between PWM variables, perceived risk, and reported risky driving engagement.

Note: Dotted lines indicate retained but non-significant pathways; *$p < .05$, **$p < .001$

driver prototype similarity on perceived risk was, β = -.05 (*SE* .02, 95% C1s -.09 ~ -.02, *p* = .011), and on reported risky driving engagement was, β = .09 (*SE* .02; 95% CIs .05 ~ .14, *p* = .012). The standardized indirect effect of behavioral willingness on reported risky driving engagement was, β = .04 (*SE* .01; 95% CIs .03 ~ .09, *p* = .003). Of the PWM variables, behavioral willingness had the strongest negative relationship with perceived risk and the strongest positive relationship with reported risky driving. In summary, as shown in Figure 1, there was support for all hypotheses, except H6, where sex differences were only found for male drivers reporting higher risky driver type prototype similarity, and behavioral willingness.

4. Discussion

Considering the differences between young driver license types, the study aimed to enhance understanding of the predictive value of risky driver prototypes (favorability, similarity), behavioral willingness to engage in the fatal five driving behaviors and perceived risk on self-reported engagement in risky driving. Potential influences of driver sex and driving experience (length of licensure, driving frequency) on reported engagement in risky driving were also examined. Some differences were found between driver license types, and goodness-of-fit statistics showed that the data fitted the hypothesized model, revealing significant pathways and relationships between variables. Results indicated that risky driver prototypes and behavioral willingness, as well as driver's sex and driving experience, may help to explain individual differences in perceived risk and young driver reported risky driving. These relationships are important, as identifying relevant factors that could be amenable to change, such as PWM variables, may contribute to improved road safety initiatives, and provide information and support to counter factors that might otherwise facilitate young drivers' risk perceptions and risky driving engagement.

While respondents representing the three license types did not differ in their perceived risk, there were differences between P1 drivers compared with P2 and Open license drivers on other variables, which were sustained after controlling for driver experience (length of licensure, driving frequency). Specifically, P1 drivers reported lower willingness to engage in the fatal five driving behaviors, and lower reported risky driving engagement (engagement in driving violations), compared with P2 and Open license drivers. No differences were found between P2 and Open license drivers on these variables.

Table 1 (perceived risk by license type) showed that this sample of young drivers reported that driving behaviors such as drink driving, driving without a seatbelt, or while fatigued, mobile phone use, unsafe overtaking, tailgating and illegal driving maneurvers were risky. Previous research has demonstrated a negative association between perceived risk and risky driving engagement where, generally young drivers who engage in, or who are exposed to, risky driving behaviors, also perceive driving risks as low, and that those perceiving risk as high were less likely to undertake the driving behavior (Harbeck et al., 2017; Ivers et al., 2009; Sarkar & Andreas, 2004; Ulleberg & Rundmo, 2003).

Similar to previous research, young drivers who perceived driving behaviors as high risk still reported engaging in these behaviors (Harbeck & Glendon, 2013; Harré, Brandt, & Dawe, 2000; Ivers et al., 2009). This was seen in the current study (see Table 3) as frequency of engaging in the last month was reported as sometimes or above (range 2-4: sometimes, often, always) for over 50% of the sample in half of the transient driving violations. From a survey of 20,822 young Australian provisional drivers, Ivers et al. (2009) reported that high risky driving engagement scores were associated with a 50% increased crash risk. Therefore, what young drivers are willing to engage in (Table 2) as well as what they report engaging in (Table 3) is likely to be important. Table 3 indicated that speeding-related behaviors (e.g., driving up to 10km/hr over the speed limit, speeding in areas unlikely to have speeding

radar/cameras, speeding while overtaking, speeding out of intersections, and when traffic signals/lights are amber) were reported to be engaged in most frequently.

Compared with the other risky driving behaviors measured, young drivers in this sample also reported the highest behavioral willingness to engage in speeding-related behaviors (Table 2). Specifically, driving at 70km/hr in a designated 60km/hr speed zone was reported to be perceived as the least risky for this sample (Table 1), while driving up to 10km/hr over the speed limit was the most frequently reported driving behavior engaged in. However, the likelihood of a motor vehicle crash when driving at 70 km/hr is four times the likelihood at 60 km/hr (Kloeden, McLean, Moore, & Ponte, 1997). Similarly, driving while distracted was also perceived as less risky compared to the other driving behaviors (Table 1), and had higher behavioral willingness (Table 2). These results indicated that driving behaviors of speeding and driving while distracted need further targeted preventive strategies and interventions for this driver demographic.

In the path model, driver experience variables (length of licensure, driving frequency) were positively related to behavioral willingness. While only driving frequency was positively associated with reported risky driving engagement, the correlation was small (albeit significant). Research has highlighted that young P1 drivers, who have begun to drive unsupervised, have the greatest risk of injury and death in motor vehicle crashes (Sagberg & Bjørnskau, 2006; Williams, 2009), and are also often found to be at fault for the crash (Braitman, Kirley, McCartt, & Chaudhary, 2008). This risk level is attributed to variables associated with high crash risk, such as driver sex, age, low driving experience, and poor hazard detection and response skills (Borowsky, Shinar, & Oron-Gilad, 2010; Scott-Parker et al., 2012a).

After a novice driver's first six months' unsupervised driving experience, crash risk falls rapidly and continues to fall over the next 18 months (Williams, 2003, 2009; Williams &

Mayhew, 2008). As young drivers adjust to further unsupervised driving on the road, this may be one reason why P2 and Open license young drivers reported higher willingness to engage in risky driving. It is also during this time that restrictions (e.g., higher speed, number of passengers, hands-free cell phone use) placed on P1 drivers are removed (Scott-Parker & Rune, 2016). Drivers have also reported high engagement in risky driving behaviors during this time for various reasons, including: gaining autonomy, self-enhancement, optimism bias, to please friends, and to gain a more adult-like status (Arnett, 1997; Begg & Langley, 2001; Fernandes et al., 2007; Harré, Foster, & O'Neill, 2005; Scott-Parker et al., 2012a). Knowing such differences may aid traffic safety initiatives and prevention strategies in what demographic (e.g., license type) to target, and at what GDL system stage.

The PWM, specifically the prototypes and willingness antecedents, was associated with young driver perceived risk and reported risky driving engagement. As modelled in Figure 1, support was found for H1-H4 – if young drivers had a favorable risky driver prototype, and identified as being similar to the risky driver represented by that prototype, then they expressed higher willingness to engage in the fatal five driving behaviors. This pathway was associated with lower perceived risk and higher reported engagement in risky driving, specifically in driving violations. These relationships were also consistent with research examining PWM and risky driving behavior (Cestac et al., 2011; Pearson & Hamilton, 2014; Scott-Parker et al., 2012a; Thornton et al., 2002).

Contrary to our findings, Schmidt et al. (2014) found that for their sample of drivers, prototypes were not related either to willingness or to risk-taking in four risky driving domains (aggressive driving, substance use, distraction, moving violations). However, strong positive direct pathways were reported between behavioral willingness and these four risky driving domains. Schmidt et al.'s (2014) sample demographics were similar to ours, being characterised by a high proportion of females, comprised of undergraduate students (mean age

18 years, range 17-22), but only included provisionally licensed drivers. The focus of Schmidt et al. (2014) was the influence of PWM variables in explaining relations between parent and teen risky driving practices within each of the four risky driving domains measured. As the current sample comprised young Australian drivers, and Schmidt et al.'s (2014) were Canadian, the respective young driver samples would have been exposed to different driving license systems, which may help to explain the contrary findings.

Although a negative relationship was found between perceived risk and reported driving engagement (supporting H4), young drivers still reported engaging in risky driving. That drivers are aware of the risks associated with driving is often reported in the literature, and has been linked with actual and perceived driving skills improvement during the first few years of driving (Pearson & Hamilton, 2014). However, if there is a recurrent lack of negative feedback, such as penalties (e.g., fines, demerit points on license), and crashes following violations, regardless of the level of perceived risk, young drivers may still choose to engage in risky driving (Delhomme, Verlhiac, & Martha, 2009).

The anonymous online questionnaire allowed participants to report honestly and without penalty about their risky driving engagement, including some illegal driving behaviors, which may have reduced potential social desirability bias. Research examining various methodologies has found that self-report data from young drivers adequately matches naturalistic driving variables (e.g., Lajunen & Summala, 2003; Taubman – Ben-Ari, Eherenfreund-Hager, & Prato, 2016; Zhao et al., 2012).

While study limitations included using a predominately female student sample, which affects results generalizability, sufficient males were included to be able to identify sex differences. As research has found that university student populations and general populations can differ in predictors of risky driving (e.g., Fernandes et al., 2007), caution is needed in interpreting our findings beyond the current sample. To address this, future research with the

proposed modelled pathways using a more sex-balanced sample from the general population of young drivers will be needed. Particularly because when, compared with females, males report higher engagement in risky driving, for example as reflected in traffic violations (Scott-Parker & Proffitt, 2015; Wohleber & Mathews, 2016), and other fatal five behaviors (e.g., speeding, drink-driving, fatigue; Fernandes et al., 2010). Other limitations include the cross-sectional design, self-report data, and common method variance (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

5. Conclusion

Our model using the psychosocial theoretical framework of prototype willingness showed that young driver prototypes and their behavioral willingness was associated with lower perceived risk and higher reported engagement in driving violations. Campaigns designed to address these factors may lead to improved perceived risk and lower engagement in risky driving behaviors, such as the fatal five. Risky driving engagement is frequently cited as a key contributor to international road deaths and injury tolls for young drivers who are often over-represented when compared with other driver demographics. Further research is needed to explore likely determinants and predictors of risky driving behaviors for this high-risk group. Road safety initiatives targeting this demographic should remain an important issue internationally for researchers, policymakers, practitioners and governments.

6. Practical applications

Examining potential underlying influences for young driver risky driving engagement, and for the different driving, behaviors is important for road safety interventions, as identifying relevant factors that could be amenable to change, such as the PWM variables, may contribute to improved road safety initiatives and provide information and support to counter factors that might otherwise facilitate young drivers' risk perceptions and risky driving engagement.

Knowing such differences may aid traffic safety initiatives and prevention strategies in what demographic (e.g., license type) to target, and at what GDL system stage. For example, a suggestion might include media portrayals of "risky driver prototypes" so that while their behavior might appear attractive to young novice drivers, the outcomes of their risky driving (e.g., cell phone use, speeding) can have unintended consequences (e.g., front end collisions, death of a friend or family member). In addition, incorporating driver prototypes may assist in research that examines the influence of peers and parents who may be perceived as a risky driver prototype on young driver behavior.

Rather than focusing on factors that are difficult or unable to be changed in a young driver, such as age, sex, personality, and cognitive biases, research exploring whether these prototypes and their behavioral willingness are responsive to change in young drivers may be a significant next step in supporting road safety initiatives. The newly created measure of perceived risk and behavioral willingness, which includes an expanded range of driver behaviors, also provides future research with preliminary psychometrics of reliability and validity for use of the measures.

Acknowledgements

We thank all our respondents for their participation. We acknowledge the assistance of (name removed for peer review), who supervised the first author's PhD candidature and proof-read the article.

Funding

The first author acknowledges assistance from a Commonwealth Government supported PhD scholarship. This research did not receive any other specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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