

Drivers, perceived legitimacy of enforcement practices for sleep-related crashes: what are the associated factors?

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Abstract

The purpose of traffic law enforcement is to deter risky driving behaviours. The aim of this study was to examine the individual factors of demographic, personality constructs, and attitudes for their association with perceived legitimacy of traffic law enforcement of sleep-related crashes. In total, 293 drivers completed a survey that assessed perceived legitimacy of enforcement and attitudes towards sleepy driving, as well as individual factors of demographic, personality and risk taking factors. The results demonstrate that younger drivers, drivers with higher levels of extraversion, and those with tolerant attitudes towards sleepy driving were less likely to agree that it is legitimate to charge someone if they crash due to sleepiness. The attitudes towards sleepy driving variable had the largest association with perceived legitimacy. Thus, the factors associated with perceived legitimacy of traffic law enforcement of sleep-related crashes are multifaceted. Overall, the findings have relevance with attitudinal and behaviour change programs, particularly with younger drivers.

Highlights:

- Perceptions of traffic law enforcement is important with road rule compliance
- Young drivers, higher on extraversion, and tolerant attitudes were related to perceived legitimacy
- Attitudinal and behaviour change programs focused on younger drivers could benefit from these results

1. Introduction

Sleep-related crashes account for a significant proportion to all fatal and severe road crashes. The current estimates suggest that sleepiness is a factor in approximately 20% of all fatal and severe road crashes.^{1,2} Traffic laws heavily regulate use of the road network. There is an increased likelihood for trauma with several risky driving behaviours and therefore, traffic laws are designed to promote safer driving behaviours.³ Many countries have enacted specific traffic laws that allow for subsequent traffic policing activities (e.g., random roadside breath testing, speed cameras use, oral saliva drug screening) aimed at reducing instances of risky driving behaviours such as drink driving, speeding and, drug driving.

A risky driving behaviour that is not as heavily regulated or enforced is driving while sleepy.^{4,5} The reason for the lack of regulation and enforcement of sleepy driving, is largely due to the absence of an objective, reliable, and validated technology that can quantify an individual's level of sleepiness, akin to a breathalyser for drink driving. After a crash has occurred and the investigating police have concluded the crash was primarily due to sleepiness, formal charges can be laid against the individual driving the vehicle. In Australia, drivers can be charged under the individual jurisdictions *Criminal Code or Traffic Act*. The charge of *dangerous operation of a vehicle* (also known as *dangerous driving*) comes from the jurisdictions *Criminal Code* (s 328A of the Queensland Criminal Code Act, 1899) and is a more severe charge, with a longer term of maximum imprisonment of 3 years for the misdemeanour. Whereas, *driving without due care and attention* from s 84 of the Queensland Transport Operations (Road Use Management) Act (1995), is a less severe charge with a shorter term of imprisonment of 6 months for the maximum penalty.

A number of factors (e.g., quality of evidence, fatal vs. non-fatal crash, medical report, specifics of the case) can however, influence the type of charge laid and if legal prosecution proceeds or whether charges are laid at all.^{6,7} The defence of honest and

reasonable mistake (s 24 of the Queensland Criminal Code Act, 1899) is available to those individuals charged with *driving without due care and attention* or the *dangerous operation of a vehicle*. The outcomes of the Australian High Court case of *Jimines v. The Queen* (1992) established that the defence of honest and reasonable mistake is a viable for defendants. Specifically, the High Court's decision that the actions of a driver while asleep "are not conscious or voluntary (an act committed while unconscious is necessarily involuntary) and they could not be criminally responsible for driving the car in a manner dangerous to the public" shifts the focus of any case to the moments leading up to the driver falling asleep. That is, the defendant can propose an honest and reasonable belief that their driving was not dangerous, and thus the burden falls on the prosecution to prove beyond reasonable doubt, that the defendant did not have this belief and was cognizant that driving in their current state would ultimately lead to them falling asleep.

In Australia, these legal precedents from the *Jimines* case as well as the previously mentioned factors and the lack of an objective measure of sleepiness mean convictions for sleepy driving are very infrequent.^{4,7} Similar outcomes of infrequent sanctions also occur in countries such as Finland⁸ even though Finnish traffic law explicitly forbidding driving while tired (Article 63 (3.8.1990/676) of the Finnish Road Traffic Act). Nonetheless, despite the difficulties with enforcement of crashes due to sleepy driving, the possibility of being prosecuted is real and this possibility should have an important deterrent role.

Ultimately, risky driving behaviours that are difficult to verify/prove are also difficult to enforce, prosecute, and therefore, it is difficult to modify driver's behaviours through enforcement methods. Even with numerous road safety campaigns describing the dangerousness of driving while sleepy, a substantial proportion of Australian drivers (70%) report they have continued to drive when aware of their sleepiness.⁹ A number of factors can influence performing a risky driving behaviour and the beliefs or attitudes an individual holds

towards risky driving behaviour can affect the likelihood of performing that behaviour.

Several studies have consistently demonstrated that positive attitudes towards a risky driving behaviour are moderately associated with performing that risky driving behaviour.¹⁰⁻¹³ Other aspects related to attitudes are likely to influence performing risky driving behaviours.

Several studies have demonstrated drivers tend to have ambivalent views regarding the culpability of drivers who crash due to sleepiness,¹⁴ particularly the views of younger drivers.¹⁵ Ambivalent views towards driver sleepiness and culpability likely contribute to more tolerant attitudes towards sleepy driving. It also follows that having positive attitudes towards a risky driving behaviour can also affect perceptions of the legitimacy of enforcement of that behaviour. It has been argued that perceptions of legitimacy and attitudes are separate but related constructs.^{16,17} That is, attitudes of sleepy driving are, by definition, different from perceptions of enforcement of sleepy driving.

Research examining the relationship between perceived legitimacy of traffic enforcement and risky driving behaviours is increasing. However, the individual factors that are associated with perceived legitimacy are poorly understood. Demographic factors such as age, sex, and education level have all been associated with driving while sleepy and with attitudes towards traffic laws enforcement. For instance, younger drivers have been shown to drive more frequently when sleepy¹⁸ and male drivers perform more risky driving behaviour than females.¹⁹ Being a younger driver and being male are also related to negative attitudes towards traffic rule compliance as well as fairness of enforced traffic rules, and respect for the law.^{20,21} Whereas, higher levels of education has been associated with more positive perceptions of the legitimacy of laws and subsequent compliance with the law.^{22,23}

Personality constructs are also likely to be related to perceived legitimacy of traffic law enforcement given the association between such constructs with crash involvement, risky behaviour and attitudes towards traffic safety and traffic law enforcement. Several meta-

analytic studies have demonstrated that lower levels of Agreeableness and Conscientiousness as well as higher levels of Extraversion are associated with a greater likelihood of being involved in a crash^{24,25}. Lower levels of Agreeableness and Conscientiousness as well as higher levels of Extraversion are all associated also with various types of risky driving behaviours²⁶⁻²⁸. Risky driving behaviours are associated with negative perceptions of traffic law enforcement²⁹. Ulleberg, Rundmo¹⁰ have shown that personality traits have small to moderate correlations with attitudes towards traffic safety and traffic law enforcement. However, af Wählberg et al.²⁵ suggests that personality constructs only account for 1% of the variance of crash involvement. Considered together, personality constructs seemingly have larger associations with attitudes and risky behaviour, than actual crashes which is likely due to the infrequency of crashes.

In summary, a number of factors are likely to influence perceptions of enforcement and sleepy driving behaviours. However, the relationships between individual factors and perceptions of legitimacy of sleepy driving enforcement are relatively unknown. A reanalysis of previously collected data³⁰ was performed to examine these relationships more deeply. As such, the aim of the study was to examine which individual factors were associated with perceived legitimacy of enforcement of sleepy driving.

2. Method

2.1 Participants

Eligibility criteria for taking part in the study required participants to have an Open/unrestricted drivers licence and to be a current driver on the road network. The Open/unrestricted drivers licence criteria was employed to ensure participants had adequate on-road driving experience for the responses they would provide. Overall, 293 participants took part in the study. The average age of participants was 39.20 years ($SD = 15.10$; range = 20-84) with 59.10% of participants being female. Approximately two-thirds of participants

(58.70%) reported having a University level of education. On average, participants were licenced for 22.71 years ($SD = 20.44$), with the majority of participants (61.40%) driving between 1 and 10 hours per week, whilst 33.07% drove 10–20 hours per week and the remaining participants (5.53%) drove greater than 20 hours per week. Participants were offered the opportunity to enter a random draw for one of six 50 AUD petrol vouchers for participating in the study.

2.2 Measures

2.2.1 Demographic information

The demographic information collected included participant age, sex, and education level. Traffic-related demographic data, such as the duration of licensure and a measure of driving exposure (i.e., number of hours driven per week) was also collected.

2.2.2 Perceived legitimacy of enforcement of sleep-related crashes

Generally, the enforcement of sleepy driving laws such as dangerous driving for commuter drivers (i.e., non-heavy vehicles) generally occurs in a retrospective manner when a driver has crashed their vehicle, with this being the focus of the perceived legitimacy items. The perceived legitimacy of enforcement of sleepy driving was assessed via two items, which asked participants to indicate their agreement with statements on a 5-point Likert scale scored 1 (strongly disagree) to 5 (strongly agree). The items were “It is fair to charge someone if they crash due to sleepiness?” and “It is fair to enforce dangerous driving due to sleepiness?” A scale score was created by averaging the score from the items.

2.2.3 Attitudes

Personal attitudes towards sleepy driving were measured using the ‘definitions’ component of Akers’ social learning theory.³¹ Participants indicated their agreement with six items (two positive, negative, and neutral items) on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Examples include, “People who drive when they think they

are sleepy are generally more careful on the road” (positive), “There is no excuse for sleepy driving” (negative), and “It’s okay to drive when you feel sleepy, as long as you don’t do it too much” (neutral). An attitudes scale score was created by first reverse scoring the negative items and then averaging all the items. The reliability and validity of the ‘definitions’ component from Akers’ social learning theory has been demonstrated from previous research.^{32,33}

2.2.4 Personality constructs

Personality constructs were assessed via the mini International Personality Item Pool mini-IPIP:³⁴ The mini-IPIP utilises a five-factor model of personality, which are extraversion, conscientiousness, agreeableness, emotional stability, and intellect/imagination. Participants rate how well 20 items are a description of themselves. The items utilising a 5-point Likert scale are scored from 1 (very inaccurate) to 5 (very accurate); the five personality constructs are measured by 4 items that include a combination of positively and negatively worded items for each factor. Examples of the items include, “am the life of the party” (extraversion), “make a mess of things” (conscientiousness: negative item), “sympathise with others’ feelings” (agreeableness), “am relaxed most of the time” (emotional stability: negative item), and “have a vivid imagination” (intellect/imagination). The items of each construct are summated to produce the five personality constructs. The mini-IPIP has been shown to be a reliable and valid measure of the five-factor model of personality.^{34,35}

2.2.5 Risk taking

Driving related risk taking was measured via Donovan’s³⁶ risk taking scale. This scale utilises eight items to measure driving related risk taking with responses ranging from 1 (never) to 4 (very often) – the anchors were reversed from the original scale created by Donovan’s³⁶ to the direction of the anchors were consistent across all scales used in the study. Examples items are “out-manoeuvre other drivers for the thrill of it?” and “drive

dangerously because you enjoy it?" An overall risk taking scale score was calculated by averaging all the items together. The scale has shown good reliability with a Cronbach's alpha of .83³⁶ and has demonstrated predictive and construct validity.³⁷

2.3 Procedure

The study protocol received ethical and health and safety approval from the relevant committees. Advertisement of the study employed the university online environ (e.g., research participation webpages and university mailing lists). Individuals that wanted to participant in the study were provided with a link to the online survey via the recruitment information. The link to the survey was active for one month and the same Internet Protocol address could not access the survey more than once. The survey took approximately 10-15 minutes to complete.

2.5 Statistical Analyses

To determine which individual factors were associated with perceived legitimacy of enforcement of sleepy driving was performed with a hierarchical liner regression analysis. To control for the influence of the demographic variables, age, sex, and education were entered at the first step, with the personality constructs, risk taking, and attitudes entered at the second step.

3. Results

3.1 Descriptive Statistics

Table 1 displays the means, standard deviations, and Cronbach's alpha of the study variables. The mean for the perceived legitimacy variable was slightly over the mid-point of possible scores, indicating a slightly positive view of sleepy driving enforcement.

Participants' scores for the personality factors were on or slightly over the mid-point of possible scores. Overall, the attitudes towards sleepy driving were not overly favourable nor were the participants' propensity for risk taking which was low. The distribution of risk

taking variable has an extensive positive skew and could not be used in the regression analysis. Thus, the risk taking propensity variable was re-coded to a dichotomous variable to enable its use in the regression analysis to those who reported no risk taking propensity (score of 1: 52.90%) and those reporting some risk taking propensity (scores greater than 1: 47.10%).

Table 1. Means, standard deviations, and Cronbach's alpha of the study variables

Variable	<i>M</i>	<i>SD</i>	Cronbach's α	Abs. range	Act. range
Perceived legitimacy	3.53	0.86	.77 ^a	1-5	1-5
Attitudes	2.09	0.68	.81	1-5	1-5
Extraversion	12.23	3.45	.76	4-20	4-20
Conscientiousness	14.31	2.87	.73	4-20	6-20
Agreeableness	16.00	2.62	.71	4-20	7-20
Emotional stability	14.76	3.11	.74	4-20	6-20
Intellect/imagination	15.43	2.77	.66	4-20	7-20
Risk taking ^b	1.20	0.35	.90	1-4	1-4

^a Spearman-Brown coefficient; ^b Pre-re-coded data displayed.
Abs. = Absolute; Act. = Actual

3.2 Bivariate analysis

Table 2 displays the bivariate correlations between the study variables. Several of the study variables correlated with the perceived legitimacy variable; these included age, extraversion, risk taking, and attitudes. Attitudes had the largest correlation with the perceived legitimacy variable. A number of small correlations were also observed between the study variables.

Table 2. Bivariate correlations of the study variables with perceived legitimacy

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Perceived legitimacy	-										
2. Age	.17**	-									
3. Sex (male) ^a	.01	.19**	-								
4. Education (university) ^a	-.02	-.08	.12*	-							
5. Attitudes	-.45**	-.12*	-.14*	.06	-						
6. Extraversion	-.10	-.24**	.13*	.10	-.01	-					
7. Conscientiousness	.09	.16**	.01	-.02	-.22**	.04	-				
8. Agreeableness	-.02	-.13*	.34**	.22**	-.09	.34**	.09	-			
9. Emotional stability	.04	.19**	-.12*	.04	-.06	.10	.33**	.07	-		
10. Intellect/imagination	.01	-.13*	-.04	.20**	-.05	.23**	.00	.25**	.14*	-	
11. Risk taking (some) ^a	-.10	-.18**	-.16**	-.01	.28**	.09	-.10	-.08	-.05	.07	-

* $p < .05$, ** $p < .01$.

^a point bi-serial correlation with a continuous variable and phi correlation with a dichotomous variable.

3.3 Multivariate analysis

The results from the hierarchical linear regression can be seen in Table 3. The variables of age, sex, and education (university) were entered at the first step and this model was a significant predictor of the variable perceived legitimacy with age being the only significant predictors of the perceived legitimacy variable. At the second step the personality constructs, risk taking, and attitudes were entered into the model. This second model was a significant predictor of perceived legitimacy which accounted for 18% of the variance. Age continued to be a significant predictor in this model with extraversion and attitudes also significant predictors of the perceived legitimacy variable. Such that, being older, being less extraverted, and not having positive attitudes towards sleepy driving were associated with greater perceptions of legitimacy of the enforcement of sleepy driving.

Table 3. Hierarchical linear regression of the study variables and their relationship with perceived legitimacy

Variable	<i>B</i>	SE <i>B</i>	β	<i>r</i> _{ab.c}	<i>r</i> _{a(bc)}
Step 1					
Age	0.01**	0.01	.21	.20	.20
Sex (male)	0.05	0.12	.02	.02	.02
Education (university)	-0.03	0.12	-.01	-.01	-.01
Constant	3.03**	0.27			
Adjusted $R^2 = .03$; $F(3, 267) = 3.94^{**}$					
Step 2					
Age	0.01*	0.01	.12	.12	.11
Sex (male)	0.01	0.12	.01	.01	.01
Education (university)	0.07	0.11	.04	.04	.03
Attitudes	-0.59**	0.09	-.40	-.39	-.37
Extraversion	-0.04*	0.02	-.12	-.12	-.11
Conscientiousness	-0.01	0.02	-.01	-.01	-.01
Agreeableness	-0.02	0.02	-.05	-.05	-.04

Emotional stability	0.01	0.02	.02	.02	.01
Intellect/imagination	0.02	0.02	.06	.06	.05
Risk taking (some)	0.03	0.12	.02	.02	.02
Constant	4.70**	0.63			
Adjusted $R^2 = .18$; $F(10, 260) = 6.76^{**}$; R^2 change = .15; $F_{\text{change}}(7, 260) = 7.67^{**}$					

* $p < .05$, ** $p < .01$.

4. Discussion

Understanding the factors that are related to perceptions of enforcement are important to improve road safety outcomes. The majority of studies focused on sleepy driving have been concerned with examining external factors (e.g., destination arrival, duration of driving) or individual issues of sleepiness (e.g., sleep habits, daytime sleepiness, and symptoms of a sleep disorder) and their relationship with driving while sleepy or having a sleep-related crash. However, little research has focused on issues surrounding perception of legitimacy of enforcement of sleep-related crashes, including, which psychological factors are associated with the behaviour. Thus, the aim of this study was to examine the individual factors associated with perceptions of legitimacy of sleepy driving enforcement.

A number of factors were related to perceived legitimacy of enforcement of sleepy driving crashes. The association of age with perceived legitimacy was a positive relationship, such that younger drivers were less likely to agree that it is legitimate to charge someone if they crashes due to sleepiness. This finding is consistent with previous research, as younger drivers generally hold less favourable views towards traffic law enforcement.^{20,38} Previous research also highlights younger drivers having lower risk perceptions of the dangerousness of sleepy driving³⁹ but are more vulnerable to the effects of sleepiness⁴⁰ than older drivers. Considered together, younger drivers represent a group of drivers that are at risk and thus, improving younger drivers' perceptions of traffic law enforcement is a critical task for road safety agencies.

The variable attitudes towards sleepy driving had the largest association with perceived legitimacy. Previous research has demonstrated that positive attitudes towards speeding e.g.,^{41,42}, drink driving e.g.,^{11,43} as well as drug driving e.g.,¹³ have been associated with greater prevalence of performing those risky driving behaviours. Moreover, several studies have demonstrated drivers tend to have ambivalent views regarding the culpability of drivers who crash due to sleepiness^{14,15} and it is likely that more positive attitudes could contribute to these ambivalent views. It is also worth noting the largest bivariate correlation was between attitudes and perceived legitimacy. It has been argued that attitudes and perceived legitimacy are two key factors that facilitate the performance of risky driving behaviours e.g.,¹⁶ As a consequence, the results from the current study provides an avenue for educational campaigns to focus on modifying driver's attitudes and perceptions of legitimacy of traffic law enforcement in an attempt facilitate behaviour change.

The personality construct of extraversion was also negatively associated with perceived legitimacy of enforcement of sleepy driving. The majority of empirical studies on perceived legitimacy typically focus on issues of trust, public confidence, and procedural justice with compliance with the law, accordingly scant research is available examining personality constructs with perceived legitimacy. However, previous research suggests that younger individuals⁴⁴ and adult⁴⁵ traffic offenders tend to have higher levels of extraversion when compared to non-traffic offenders with other findings demonstrating higher levels of extraversion are associated with more traffic violations⁴⁶ and crashes^{24,47} supports the current study's findings. It is notable that none of the other personality constructs were significantly associated with perceived legitimacy – particularly the construct of agreeableness. Higher levels of agreeableness have been associated in a number of studies with a lower likelihood of committing illegal behaviours^{48,49}. Additionally, higher levels of agreeableness have also been associated with a low likelihood of performing risky driving

behaviours²⁶⁻²⁸. Thus, the absence of any relationship, even at the bivariate level, was surprising.

A potential explanation for the lack of association between agreeableness and perceived legitimacy can be found by considering how widespread driving while sleepy is performed. That is, a number of studies suggest that substantial proportions of individuals (69-73%) have continued to drive when aware of their sleepiness^{9,18} and given the lack of an objective measure and aside from crashing, there is little recourse when performing the behaviour. It has been noted that it is difficult for an offense to be socially isolating and immoral if it is commonplace in society^{23,50}. Thus, given sleepy driving behaviours are performed so commonly, with little to no recourse, it is likely that the majority of drivers do not view the behaviour as a deviant one. If public perceptions pertaining to the wrongfulness of sleepy driving are to change, then it is likely perceptions of legitimacy (amongst other factors) need to increase to effect a strong cultural change, similar to the change that occurred with attitudes towards drink driving throughout the 1980 in Australia e.g.,⁵¹.

When interpreting the overall relationships of the analyses, the findings potentially have relevance with attitudinal and behaviour change programs, particularly with younger drivers whom are a group of drivers at higher risk of crashing due to sleepiness¹. The regression analysis demonstrated that younger drivers were less likely to agree that the enforcement of sleepy driving was legitimate, which is consistent with other research that has assessed younger drivers attitudes towards traffic law enforcement^{20,38}. Attitudinal and behaviour change programs that are specifically targeted towards those of younger drivers could increase younger drivers' perceptions of legitimacy, which has the potential to reduce their sleepy driving likelihood. Such efforts are potentially invaluable with road safety outcomes with younger drivers as younger drivers are more vulnerable to the effects of sleepiness⁴⁰ and have lower risk perceptions of the dangerousness of sleepy driving³⁹ than

older drivers and are, in general, overrepresented in sleep-related crashes.¹ Thus, improving the safety outcomes for younger driving is a important road safety task.

There are some limitations of the current study that should be noted and considered when interpreting the study outcomes. First, the sampling methodology utilised in the study was a convenience sample, that is, participants were not randomly selected for participation. The study design was cross-sectional and thus, establishing the causal direction of the relationship between the study variables is not possible. Future research could seek to replicate the study with a broader sample such as a representative sample of drivers. Additionally, the study variables could be examined with a sample of drivers that are exposed to greater instances of driving while sleepy (e.g., shift-workers, heavy vehicle drivers, professional drivers) to determine if the same relationship exist with other samples of drivers.

The current study sought to determine the factors associated with drivers' perceived legitimacy of enforcement for sleep-related crashes as well as determining the relationships between age, perceived legitimacy, attitudes, and sleepy driving likelihood. The obtained results demonstrated that age, the personality construct of extraversion, and attitudes were associated with perceived legitimacy of sleepy driving enforcement. The current results have relevance with attitudinal and behaviour change programs, particularly with younger drivers.

5. Acknowledgements

Removed for blind review - see attached document.

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