Deterrence of Drug Driving:

The Impact of the ACT Drug Driving Legislation and Detection Techniques.

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Abstract

Drug driving is a significant road safety concern rendering the implementation of roadside drug testing in all Australian jurisdictions. The current research sought to examine the impact of recently introduced roadside oral fluid screening in the Australian Capital Territory (ACT). Specifically, the study sought to examine drivers' awareness, perceptions and perceived deterrent impact of these operations and the degree to which they influence likelihood of future drug driving. A total of 801 male and female motorists aged 17-88 years of age completed a phone interview assessing demographics (e.g., driving and drug taking history), awareness and perceived effectiveness of roadside drug testing, and constructs central to both Classical Deterrence Theory (i.e., certainty, severity, swiftness) and reconceptualised deterrence theory (direct and vicarious experiences of both punishment and punishment avoidance) frameworks. Overall, despite an apparent decline in drug driving behaviour since the introduction of roadside testing, a large proportion of driver's possessed a poor awareness of these operations and did not perceive a high certainty of apprehension. Age, punishment avoidance and vicarious punishment avoidance were found to predict future likelihood of drug driving, whilst Classical Deterrence Theory variables did not. Contrary to expectations and previous studies, few significant differences were found with regards to gender. Findings are interpreted in light of the recency of roadside drug testing in the ACT and the need for future studies to examine the impact of such operations. Further recommendations for augmenting the deterrence of drug driving are discussed.

Keywords: Drug driving, motorists, ACT Legislation, deterrence theory, awareness, drug driving likelihood

1. Introduction

1.1 Prevalence and Impact of Drug Driving

Internationally and within Australia, between 8.80%-39.60% of road fatalities and between 2.70%-41.30% of road injuries have been attributable to drug-affected driving (Athanaselis et al., 1999; del Río, Gómez, Sancho, & Alvarez, 2002; Drummer et al., 2003, 2004b; Longo, Hunter, Lokan, White, & White, 2000; Mura et al., 2006; Swann, Boorman, & Papafotiou, 2004). Though drug driving occurs at various ages across both genders (Davey, Armstrong, & Martin, 2014), research indicates that the highest prevalence rates are among drivers aged 18-30 (Akram & Forsyth, 2000), and that males are overrepresented in both injury statistics (Berry & Harrison, 2007; Drummer et al., 2004a; Drummer et al., 2003; Longo et al., 2000) and detection rates (Davey et al., 2014). Experimental, simulated, and on-road driving studies have shown that illicit drugs including cannabis (delta-9-tetrahydrocannabinol [THC]), methamphetamines (MA), and ecstasy (3,4-methylenediox-methamphetamine [MDMA]) impair cognition, psychomotor abilities and subsequent driving performance (Battistella et al., 2013; Lundqvist, 2005; Ramaekers, Berghaus, van Laar, & Drummer, 2004). The strong relationship between drug use and increased crash likelihood and culpability (Asbridge, Hayden, & Cartwright, 2012; Drummer et al., 2004a; Drummer et al., 2003; Mura et al., 2006) is thus a significant concern in the area of road safety.

1.2 Detecting Drug Driving

Roadside oral fluid screening offers a platform for an effective ongoing deterrence strategy (Drummer et al., 2007). Similar to the both the premise and implementation of random breath testing, which has proved to reduce the road trauma associated with drink driving and effected behavior and cultural changes regarding the acceptability of driving while intoxicated by alcohol (Homel, 1988), roadside drug screening allows police to randomly stop drivers and collect an oral fluid sample, providing an immediate roadside strategy for interdiction. These programs have now been adopted by all Australian policing jurisdictions, with Australia's Capital Territory (ACT) being the last to implement this countermeasure in 2011. In line with amendments made to the Road Transport (Alcohol and Drugs) Act 1977, roadside drug testing in the ACT allows police to conduct random roadside oral fluid screening for THC, MA, and MDMA. The maximum penalty for drug driving is a fine of 10 penalty units for a first offence, or 25 penalty units and up to three months imprisonment for a repeat offender. A court can also issue a period of licence disqualification.

The creations of laws making it an offence to drive after using drugs (i.e., zero-tolerance laws) sends a strong message about the dangers of drug driving (Schwilke, Sampaio dos Santos, & Logan, 2006). Preliminary evidence suggests that roadside screening is perceived to be a deterrent amongst some drug drivers (Stevenson et al., 2001), with frequent drug drivers also indicating they would consider altering their behaviour, such as opting for alternative transport methods, with the initiation of roadside drug testing (Degenhardt, Dillon, Duff, & Ross, 2006; Furr-Holden, Voas, Kelley-Baker, & Miller, 2006). Research into the perceptions of drivers following implementation of roadside drug testing is, however, currently lacking, but essential for examining the efficacy of this road safety countermeasure.

1.3 Classical and Reconceptualised Deterrence Theory

Deterrence theory has been consistently utilised as the conceptual framework underpinning traffic enforcement. The underlying premise of Classical Deterrence Theory is that the perceived consequences of engaging in illegal behaviour will dissuade such behaviour (Homel, 1988; Zimring & Hawkins, 1973). Specifically, the theory holds that when an individual perceives the certainty of apprehension as high, the punishment as severe, and the administration of punishment as swift, then the committing of criminal acts will be deterred (Ross, 1990; Taxman & Piquero, 1998). Perceptions of certainty, severity and swiftness are conditional on the intensity and effectiveness of enforcement (Homel, 1988; Taxman & Piquero, 1998). Accordingly, although high levels of publicity regarding legal sanctions and special operations involving highly visible enforcement may initially enhance drivers' perceptions of being detected (Elvik & Christensen, 2007; Watling, Freeman, & Davey, 2014), these perceptions typically weaken over time (Homel, 1986).

Classical Deterrence Theory operates via two distinct processes: general and specific deterrence (Paternoster & Iovanni, 1986; Ross, 1990; Zimring & Hawkins, 1973). General deterrence is believed to stem from public awareness of legal sanctions (such as the penalties for drug driving), whereas specific deterrence operates at the individual level based on direct experience of legal sanctions (such as being caught for drug driving). By emphasising the experiencing of legal punishment, however, this theory neglects the influence of punishment avoidance as well as the effect that vicarious experiences can have on an individual's perceptions. In response to these limitations, Stafford and Warr (1993) proposed a reconceptualised framework emphasising four central processes that affect the deterrent process: 1) direct punishment experience; 2) vicarious punishment experience; 3) direct experience of punishment avoidance, and; 4) vicarious experience of punishment avoidance.

Consistent with Classical Deterrence Theory, punishment experiences are believed to influence perceptions of certainty and severity of punishment, and thus deter future offending. Counter-intuitively, however, many studies have found that punishment experiences increase the likelihood of offending (e.g., Paternoster & Piquero, 1995; Piquero & Pogarsky, 2002; Sitren & Applegate, 2007) arguably due to a decision making bias referred to as gambler's fallacy. After apprehension, an offender lowers their certainty of apprehension estimate, believing that being apprehended again in a short period of time is extremely unlikely (Piquero & Pogarsky, 2002; Pogarsky & Piquero, 2003). However, not all research has discovered this effect (Piquero & Paternoster, 1998), and thus the deterring impact of punishment experiences may be context-dependent. Additionally, vicarious punishment, that is, knowledge of others' experience of sanctions for illegal behaviours, can also be a deterring factor that increases an individual's perception of certainty of punishment (Paternoster & Piquero, 1995; Stafford & Warr, 1993). Nonetheless, the perceived risk of others is usually less influential than one's direct, own perceived risk (Jensen, Erickson, & Gibbs, 1978; Paternoster & Piquero, 1995). Several studies have revealed that vicarious experiences of punishment strengthen the likelihood of committing future offences (e.g., Piquero & Paternoster, 1998; Piquero & Pogarsky, 2002; Sitren & Applegate, 2007) whereas some have found the opposite (Freeman & Watson, 2006). Evidence is therefore equivocal regarding the deterring impact of vicarious experiences of punishment.

Punishment avoidance, on the other hand, is perhaps the most powerful component affecting the deterrent process (Stafford & Warr, 1993). This is due to the notion that committing an illegal act but avoiding its repercussions weakens perceptions of the certainty of punishment, and thus reinforces engagement in illegal behaviours (Paternoster & Piquero, 1995). Most studies utilising Stafford and Warr's (1993) theory have found that punishment avoidance has the strongest relationship with the likelihood to offend, across various contexts (Freeman & Watson, 2006; Paternoster & Piquero, 1995; Piquero & Paternoster, 1998; Piquero & Pogarsky, 2002; Sitren & Applegate, 2007). Similarly, vicariously experiencing punishment, such as via others' avoidance of penalties or retributions, has a been found to have a similar effect on punishment perceptions and likelihood to reoffend, albeit to a lesser extent (e.g., Freeman & Watson, 2006; Piquero & Paternoster, 1998, 2002; Sitren & Applegate, 2007; Watling, Palk, Freeman, & Davey, 2010). In the context of drug use, vicarious experiences may be more influential than personal experiences of punishment avoidance (Watling et al., 2010) as fellow drug users provide a normative frame of reference (van Dijk, 2008). Moreover, regular drug driving is often facilitated by having friends who drug drive and avoid punishment (Duff & Rowland, 2006), which likely reinforces a low certainty of apprehension (McIntosh, O'Brien, & McKeganey, 2007).

1.4 The Current Study

The relatively recent implementation of oral fluid screening in the Australian Capital Territory (ACT) provides a unique opportunity to explore the initial impact of the legislation and subsequent enforcement techniques. This research therefore aims to assess awareness, perceived effectiveness and perceptions of roadside drug testing among a large sample of drivers from the ACT.

2. Methods

2.1 Participants

Participants were 801 ACT motorists aged 17-88 years (M = 39.17, SD = 19.19). Both gender (male *n* = 401, female *n* = 400) and age groups (17-29; 30+) were equally distributed, and selected to gain a stratified sample for comparative analyses. Whilst this distribution is not necessarily reflective of the population, the data gathered for each age group and gender may be representative of greater population patterns.

Participation was voluntary and participants were free to withdraw from the study at any stage. In order to take part in the study participants were required to be aged 17 years or older, hold a current drivers licence, and drive a motor vehicle (both private and work-related) more than one hour per week.

2.2 Materials

2.2.1 *Demographic and Drug Driving Data:* Participants indicated their age, gender, employment status, and the average amount of days they drove per week. They were also asked about their lifetime and recent use (i.e., within the last year) of marijuana, ecstasy and meth/amphetamine, whether they had ever and/or recently driven within 24 hours of using, and whether they been the passenger of a drug-affected driver since the introduction of roadside oral fluid screening in May 2011.

2.2.2 *Awareness and Perceived Effectiveness*: Awareness was assessed using one item (i.e., "Are you aware that the ACT introduced roadside oral fluid drug testing in May 2011?"), to which participants responded either yes, no or unsure. Awareness of the penalty for drug driving was assessed via one item "What do you think the penalty will be if you were to be convicted of driving after using an illicit drug?" Potential responses were: fine only; licence loss only; fine and licence loss; probation; drug counselling; or all of the above – participants could only choose a single response.

Perceived effectiveness was measured using one item (i.e., "How effective do you think roadside oral fluid testing is in detecting drivers who have recently used illicit drugs?"; with responses ranging from *extremely ineffective* [1] to *extremely effective* [5]). An additional question scored on a 5-point Likert scales (*very unlikely* [1] to *very likely* [5]) was used to assess driver's perceived effectiveness of roadside testing (e.g., "Have the testing methods and legislation since May 2011 reduced the likelihood that you will drive after using illicit drugs?").

2.2.3 *Perceived Deterrence of Roadside Drug Testing:* The Classical Deterrence Theory constructs of certainty, severity, and swiftness were assessed via the items ''The chances of presently getting caught for drug driving are high'', ''I think the penalties for drug driving would be quite lenient'' (a negatively worded item, that was reversed scored), and ''If I was caught for drug driving by the police it would take a long time before I went to court and was penalised'' respectively. The reconceptualised deterrence theory consists of four constructs of punishment, punishment avoidance, vicarious punishment, and vicarious punishment avoidance. The punishment avoidance and vicarious punishment avoidance constructs were assessed via the items "I regularly drive after using illicit drugs and don't get caught" and "My friends often take illicit drugs and drive without being caught". These three Classical Deterrence Theory and two reconceptualised deterrence theory constructs were measures using a 10-point Likert-scale (e.g., "I regularly drive after using illicit drugs and don't get caught"; *strongly disagree* [1] to 10 *strongly agree* [10]).The punishment and vicarious punishment constructs were assessed via the items "Have you ever been convicted of a drug driving offence" and "I know people who have been caught and fined for driving after using illicit" these two items were measured using a dichotomous 'yes' or 'no' response. The items assessing the Classical Deterrence Theory and the reconceptualised deterrence theory constructs have been used in previous research (e.g., Freeman & Watson, 2006; Watling et al., 2014).

2.2.4 Likelihood of Future Drug Driving: One item was used to measure perceived likelihood of future drug driving ("How often do you think you will drive after using illicit drugs in the next six months?"), which was measured on a 0-182 scale with higher scores indicative of more days drug driving and served as the outcome variable in subsequent analyses.

2.3 Procedure

Following ethical clearance from the Queensland University of Technology research ethics committee, data was collected by an independent data collection agency (I-View), using a telephone survey methodology. Participants were sourced from the Association of Market and Social Research Organisations Random Digit Dialing system. The approach utilised relied on the Computer Assisted Telephone Interview (CATI) system conducted by a team of 15 experienced and trained interviewers. When an interviewer made contact with a potential participant, the interviewer explained the nature of the study, the procedure to ensure confidentiality and anonymity of responses, and requested a verbal consent from the individual to take part in the study. The call routine included both weekday and weekend calls, with interviews lasting on average 12.61 minutes. The response rate achieved for this study was 58%.

2.4 Statistical Analysis

The descriptive reporting of the study variables were in the form of means and standard deviations or percentages were appropriate. In addition, the deterrence variables were divided into three divisions (low; 1.00-3.32, moderate; 3.33-6.65, and high; 6.66-10.00) based on the 10-point scale to give an overview of the range of responses. This method of presentation is consistent with previous work (e.g., Freeman & Watson, 2006). There was some slight departures from normality with some of the deterrence variables. Thus, Spearman's rho correlation coefficients were conducted to examine the bivariate relationships and an ordered logistic regression was conducted to determine the associations between the demographic and deterrence variables and likelihood of drug driving in the future. The outcome variable of likelihood of future drug driving was recoded to a dichotomous variable for the logistic regression analysis to those who would and would not drug drive in the future.

3. Results

3.1 Participant Demographics

The majority of participants were employed (n = 573; 71.54%) and drove a vehicle daily (n = 604; 75.41%). A further 22.22% (n = 178) reported driving 3-5 times a week, with 2.37% (n = 19) driving only once a week. Overall, 36.21% (n = 290) of participants reported having used one of the three listed illicit drugs (i.e., cannabis, meth/amphetamine, or ecstasy) in the past. Cannabis was the most frequently used substance (4.99% had used within the past year) followed by ecstasy and meth/amphetamine

substances (used by 1.63% and .08% of the sample, respectively). A total of 10.74% of participants indicated that they had driven a vehicle within 24 hours of using an illicit drug in the past, the majority of whom were males ($\chi^2(1) = 7.31$, $p < .05$).

3.2 Awareness and Effectiveness of Roadside Drug Testing

Most participants (61.55%, $n = 493$) were aware that oral fluid drug testing operations had commenced, while 3.24% were unsure ($n = 26$), and 35.21% were completely unaware ($n = 282$).

Of those who had ever driven within 24 hours of taking an illicit drug (10.74%), 41.86% ($n = 36$) had done so since the introduction of roadside oral fluid screening. Whilst the occurrence of drug driving was not significantly influenced by awareness, those who reported this behaviour since the introduction of roadside testing were more aware of roadside oral fluid testing ($\chi^2(1) = 7.80$, $p < .05$). Further, 11.74% of the total sample reported having been a passenger with a driver assumed to have used illicit drugs prior to driving after the introduction of testing. Again these drivers were more likely to be aware of the introduction of roadside-testing ($\chi^2(1) = 9.16$, $p < .05$).

Younger drivers (<30 years of age) comprised the vast majority (83.33%) of participants who had driven within 24 hours of drug taking since the introduction of roadside testing. This represented 7.54% of younger drivers who had engaged in this behaviour prior to roadside testing being introduced. There was significant relationship between past behaviour and whether the individual was under the age of 30 years ($\chi^2(1) = 18.82$, $p < .05$). A similar pattern was found for passengers whose driver drove under the influence of drugs since the introduction of roadside testing, with 20.25% of those under 30 years of age having been in this situation ($\chi^2(1) = 55.92$, $p < .05$). Similarly, males were more likely than females to have been a passenger for a drug driver ($\chi^2(1) = 5.77$, $p < .05$), but were no more likely to have actually driven within 24 hours of using an illicit substance.

Approximately one quarter (25.72%; $n = 206$) of participants believed the current penalty for drug driving was a fine and licence loss, while 51.69% ($n = 414$) believed this would result in a fine, licence loss, probation, and drug counselling. The remainder of the sample believed that either one or a combination of penalties would be applied if convicted for drug driving.

Regarding perceived effectiveness, approximately half (50.68%; $n = 406$) of the sample reported that operations would be effective or extremely effective in detecting drivers who had recently used illicit drugs. Of the remaining participants, 36.20% ($n = 290$) were unsure and 13.12% ($n = 105$) reported such operations would be ineffective or extremely ineffective.

3.3 Perceived Deterrence associated with Roadside Drug Testing

The mean and standard deviations for participants' responses to the Classical Deterrence Theory and reconceptualised deterrence theory constructs can be seen on Table 1. Additionally, participants' responses were divided into three divisions (low; 1.00-3.32, moderate; 3.33-6.65, and high; 6.66-10.00) based on the 10-point scale to give an overview of the range of responses. A large proportion of the

participants fell into the moderate range regarding the *certainty* of apprehension for engaging in drug driving behaviour. Conversely, the largest proportion of participants perceived the *severity* of sanctions for drug driving to be high. Approximately one-third of participants believed that sanctions would be *swift*. Only one participant reported they had been convicted of a drug driving offence in the past (thus, the construct of direct punishment experience was excluded from this analysis and from all subsequent analyses), and only 21.28% of participants had experienced punishment vicariously. Participants' experiences of punishment avoidance and vicarious punishment avoidance were quite low.

Table 1. Self-reported perceptions of the legal sanctions for drug driving

			Low		Medium		High	
	M	*SD*	%	*n*	%	*n*	%	*n*
Classical Deterrence Theory								
Certainty	5.15	2.32	28.84	231	42.70	342	28.46	228
Severity	6.65	2.85	17.60	141	31.71	254	50.69	406
Swiftness	5.71	2.43	18.60	149	50.81	407	31.59	245
Reconceptualised Deterrence Theory								
Punishment Avoidance	1.81	2.06	86.89	696	7.49	60	5.62	45
Vicarious Punishment Avoidance	2.75	2.59	71.79	575	16.73	134	11.48	92

3.4 Likelihood of Drug Driving in the Near Future

As seen in Table 2, the variables of age, awareness, punishment avoidance, vicarious punishment, and vicarious punishment avoidance were significantly correlated, in the expected direction, with future drug driving likelihood. The Classical Deterrence Theory constructs (certainty, severity and swiftness) were not significantly correlated with future drug driving likelihood. Moderate correlations were observed between future likelihood and punishment avoidance, and between punishment avoidance and vicarious punishment avoidance. Vicarious punishment avoidance revealed a small to moderate correlation with the outcome variable.

Table 2. Spearman's rho and point-biserial correlation coefficients for study variables

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Future drug driving likelihood	-									
2. Age	**-.15***	-								
3. Sex (male)[b]	.05	-.01	-							
4. Awareness (yes)[b]	**-.08***	**.14****	**-.09****	-						
5. Certainty	-.01	**-.15****	**.09***	.06	-					
6. Severity	.01	**-.29****	-.06	-.03	**.25****	-				
7. Swiftness	.06	**-.21****	.05	.03	**.22****	**.36****	-			
8. Punishment Avoidance	**.34****	**.08***	**-.07***	.04	.01	**-.09***	-.03	-		
9. Vicarious Punishment (yes)[b]	**-.13****	**.24****	-.03	-.16	**-.13****	-.06	-.07	.01	-	
10. Vicarious Avoidance	**.26****	**-.18****	-.07	.06	.02	-.02	-.02	**.34****	**-.24****	-

Note: $^{*}p < .05$, $^{**}p < .001$.
Vicarious Avoidance = Vicarious Punishment Avoidance
[a] Continuous variable; [b] denotes a point-biserial correlation coefficient.

An ordered logistic regression was conducted to examine which demographic and deterrence variables would predict likelihood of drug driving in the future (Table 3). The variable of age, sex, and awareness of roadside testing were entered at step 1, with their combination significantly predicting the outcome variable ($\chi^2(1, 3) = 29.50$, $p < .001$). The model accounted for 11.11% of the variance in likelihood of future drug driving and correctly classified 94.92% of the participants. Age (OR = 0.95, $p < .001$) and awareness (OR = 0.37, $p < .05$) were the only significant independent predictors of future likelihood.

The second step included the addition of Classical Deterrence Theory variables of certainty, severity, and swiftness. Overall, the model remained significant ($\chi^2(1, 6) = 34.23$, $p < .001$); however, the addition of these variables did not significantly increase the predictive power of the model ($\chi^2(1, 3) = 4.73$, $p = .19$). As such, the amount of variance accounted for increased only by 1.75% (with a total of 12.86%) and the classification accuracy of the model did not change. Age (OR = 0.94, $p < .001$) and awareness (OR = 0.38, $p < .05$) remained predictive.

The third step included the addition of the reconceptualised deterrence theory variables of punishment avoidance, vicarious punishment, and vicarious punishment avoidance. This step was a significant improvement of the model ($\chi^2(1, 3) = 70.31$, $p < .001$) and continued to be a significant predictor of future drug driving ($\chi^2(1, 9) = 104.54$, $p < .001$). The amount of variance accounted for by this model increased to 37.58% (an increase of 24.72%), and the classification accuracy increased slightly to 96.06%. Age (OR = 0.95, $p < .001$) remained a significant predictor of the outcome variable, but awareness became non-significant. Punishment avoidance (OR = 1.46, $p < .001$) and vicarious punishment avoidance (OR = 1.20, $p < .05$) were also predictive of future drug driving likelihood.

Table 3. Logistic regression coefficients for future likelihood of drug driving

Variable	B	S.E.	Wald	OR	95% Confidence interval for OR	
					Lower	Upper
Model 1						
Age	-0.06	0.01	15.41	**0.95****	0.92	0.97
Sex(male)	0.39	0.34	1.36	0.68	0.35	1.31
Awareness(yes)	-0.99	0.39	6.39	**0.37***	0.17	0.80
Constant	-0.68	0.46	2.21	0.51		
Model 2						
Age	-0.06	0.02	16.01	**0.94****	0.92	0.97
Sex(male)	0.35	0.34	1.04	1.42	0.72	2.78
Awareness(yes)	-0.97	0.40	6.03	**0.38***	0.17	0.82
Certainty	-0.11	0.07	2.13	0.90	0.78	1.04
Severity	-0.08	0.06	1.68	0.92	0.81	1.04
Swiftness	0.11	0.08	2.09	1.12	0.96	1.31
Constant	-0.50	0.83	0.36	0.61		
Model 3						
Age	-0.05	0.02	11.48	**0.95****	0.92	0.98
Sex(male)	0.27	0.40	0.46	1.31	0.60	2.85
Awareness(yes)	-0.66	0.44	2.26	0.52	0.22	1.22
Certainty	-0.05	0.08	0.37	0.95	0.81	1.12
Severity	-0.01	0.07	0.01	0.99	0.86	1.16
Swiftness	0.05	0.08	0.35	1.05	0.81	1.24
Punishment Avoidance	0.38	0.07	32.32	**1.46****	1.28	1.66
Vicarious Punishment(yes)	-0.55	0.42	1.70	0.58	0.26	1.32
Vicarious Punishment Avoidance	0.18	0.07	7.88	**1.20***	1.06	1.36
Constant	-2.64	1.01	6.85	**0.07***		

Note: $^{*}p < .05$, $^{**}p < .001$.
OR = odds ratio.

4. Discussion

4.1 Awareness and Effectiveness of Roadside Drug Testing

Overall, results of the current study suggested a relatively poor awareness of roadside oral fluid screening amongst the general population. Although a sizeable proportion of drivers knew that these operations had commenced, many were unaware and were also uncertain of the precise penalties associated with drug driving offences. This latter is less surprising as the majority of participants had not been apprehended for a drug driving offence and as such had no experience with the legal sanctions involved. However, awareness was high among those who had been involved in drug driving either as a driver or as a passenger of a drug-affected driver since the introduction of roadside testing. Not surprisingly, this suggests that the message being conveyed via roadside drug testing is more receivable among those with a tendency to engage in drug driving behaviour. However, this relationship was unidirectional only, meaning that the occurrence of drug driving was not impacted by higher levels of awareness. Awareness was, however, found to predict future likelihood of drug driving among the

entire sample of drivers when reconceptualised deterrence theory constructs were not included in the analysis (discussed below). Together, these findings indicate that awareness-raising campaigns may effectively induce a negative attitude towards drug driving among general drivers, but as a standalone tactic may prove ineffective in curtailing such behaviour among frequent drug drivers.

Despite the above, there was some evidence to suggest a positive impact of roadside oral fluid screening. Among the total sample of drivers who reported a history of driving within 24 hours of drug-taking, less than half (41.86%) had done so since the introduction of roadside drug testing. Moreover, among drivers under the age of 30 who exhibited the most problematic levels of drug driving, less than 10% (7.54%) had drug driven since oral fluid screening was implemented. This finding is particularly promising given that younger drivers have been reported to have the highest culpability rates among drivers fatally injured in drug-related crashes (Drummer et al., 2004b).

4.2 Perceived Deterrence Associated with Roadside Drug Testing

An additional aim of the current study was to examine the perceived deterrent impact of roadside oral fluid screening operations in the ACT. Despite approximately half of the sample reporting that operations would be effective in detecting drug drivers, a substantial proportion (71.54%) did not perceive the certainty of apprehension to be high. Instead, there was a tendency for drivers to believe that the chances of being caught for drug driving were slim to moderate only. According to Classical Deterrence Theory, prospective offenders must believe there is a high certainty of being detected in order to be deterred from engaging in illegal behaviour (Homel, 1988; Nagin & Pogarsky, 2001; Zimring & Hawkins, 1973). In the context of drug driving, such perceptions are dependent on, and strengthened by, increased police presence and apprehension approaches at high drug driving times (Freeman, Davey, Palk, Lavelle, & Rowland, 2008). The low apprehension certainty in the current study may therefore be attributable to the relative recency of roadside drug testing in the ACT and the fact that many participants (35.21%) were unaware of these operations. Similarly, despite a large proportion of participants' perceiving that sanctions would be very severe and moderately swift, the vast majority reported having minimal to no personal and vicarious experience with both punishment and punishment avoidance. This was not surprising given the small number of motorists found to engage in drug driving and the even smaller proportion who had been apprehended for such behaviour.

4.3 Factors Predicting Future Drug Driving Likelihood

A further aim of this study was to predict the likelihood of drug driving in the next six months based on various demographic, awareness, classical deterrence and reconceptualised deterrence variables. In the final model, the factors that emerged as independent predictors of future drug driving were age, direct punishment avoidance and vicarious punishment avoidance. The finding that likelihood to drug drive was stronger among younger drivers is consistent with both findings from this study indicating that drivers under 30 comprised the majority of recent drug drivers, along with previous studies indicating that younger cohorts are more likely to drug drive (Akram & Forsyth, 2000; Watling et al., 2010). An unexpected finding was that gender was not predictive of likelihood of drug driving in the near future.

Males did, however, represent the majority of drug drivers in this study, which is consistent with a large body of research revealing higher prevalence rates of drug driving among males compared to females (Drummer et al., 2003, 2004b; Jones, 2007; Longo et al., 2000; Neale, 2004; Watling, Freeman, Palk, & Davey, 2011).

It is well-established that direct and vicarious experiences with punishment avoidance greatly influence the committing of illegal behaviors. Correspondingly, both direct and vicarious punishment avoidance predicted future drug driving likelihood among the current sample, with direct avoidance experiences emerging as the strongest predictor. The importance of these factors in facilitating future offences is consistent with previous work (e.g., Freeman & Watson, 2006; Paternoster & Piquero, 1995; Piquero & Paternoster, 1998; Piquero & Pogarsky, 2002; Sitren & Applegate, 2007; Watling et al., 2010), in which direct experiences of avoiding punishment have also been found more influential than vicarious experiences (Jensen, Erickson, & Gibbs, 1978; Paternoster & Piquero, 1995). The construct of vicarious punishment however was not significant in the model, consistent with participants' low self-reports of knowing someone who had experienced some form of drug driving punishment. It is possible that drivers' low perceptions of certainty coupled with their direct and vicarious experiences of punishment avoidance may have negated the effect of vicarious punishment experiences. Moreover, it was not possible to examine the impact of direct experiences of punishment in this study due to only one participant reporting having been convicted of a drug driving offence. Again, this highlights the fact that few drivers in this study had come into contact directly or vicariously with roadside saliva based operations in the ACT.

None of the Classical Deterrence Theory variables were predictive of future likelihood of drug driving in the current study. While these results might be a cause for concern, particularly since deterrence theory underpins most traffic enforcement, there are several reasons to remain optimistic. First and foremost, the current ACT operations are relatively new when compared to successful drink driving campaigns and, as noted earlier, participants' awareness levels of drug driving testing need to be enhanced. Awareness in the current study was only associated with a lower likelihood of drug driving in the absence of reconceptualised deterrence theory constructs (included in the final model), suggesting that the latter is more prominent in influencing drug driving likelihood. The importance of awareness is not to be dismissed, however, given that is has been shown to increase perceptions of certainty of apprehension (Watling et al., 2014). Second, prior to the initiation of roadside saliva based testing operations, perceptions of apprehension certainty were quite low (Darke et al., 2004), similar to the current study. Considering these findings, it may take considerable time and effort before awareness and perceptions of apprehension certainty will impact on an individual's decision to drug drive. The current findings would suggest that an expansion of the roadside saliva based testing campaign is warranted. Arguably, the level of publicity regarding drug driving sanctions will need to be increased to enhance awareness which, in theory, should serve to increase drivers' perceptions of being detected. It is of note that during the three-year period (2007-2010) in which roadside drug testing was implemented in Australia, drug driving significantly decreased from 20.90% to 18.00% (Australian Institute of Health and Welfare, 2011). It will thus be important to quantify deterrence perceptual trends, awareness, and drug driving rates with the growth of the ACT roadside drug testing campaign.

It is important to note that whilst the demographic and deterrence factors accounted for a significant portion of the variance in likelihood of drug driving, other factors could also contribute to this behaviour. As highlighted by Watling and Freeman (2011) a range of criminogenic factors such as defiance (i.e., experiencing feelings of shame and believing in the legitimacy of sanctioning authority) and deviance (i.e., moral attachment to the norm and having a criminal conviction) constructs are associated with drug driving intentions. The role of defiance may be particularly pertinent with drug driving behaviors (Watling & Freeman, 2011) as research has shown many drug drivers believe they can safely drive after having used an illicit drug (Darke et al., 2004; Duff & Rowland, 2006). Additionally, in some social groups were drug use is a commonly accepted activity with social interactions, drug driving is an accepted and condoned behavior (Davey, Williams, & Davies, 2001). Fellow illicit drug users therefore provide a normative frame of reference that can either sustain and support aberrant behaviours (van Dijk, 2008) or disprove and lessen drug driving behaviour (Armstrong et al., 2005; Freeman et al., 2010).Thus, alternate and or complementary strategies may be necessary for some social groups, particularly regular or long-time drug users, rather than relying on deterrence based legal sanctions alone (Yu, Evans, & Clark, 2006).

4.4 Implications for Enhancing Deterrence and Improving Future Research

The failure of Classical Deterrence Theory constructs to predict future drug driving likelihood suggests that general and specific deterrence effects need to be boosted for roadside saliva based operations within the ACT. Classical deterrence theory variables can be manipulated by traffic authorities and the police in order to increase perceptions of the effectiveness of legal sanctions to apprehend drug drivers. First, increasing perceptions of certainty of apprehension is a critical aspect for the effectiveness of deterrence (Homel, 1988; Jones et al., 2006). Previous work suggests that increasing perceptions of apprehension certainty would influence illicit drug users into not drug driving (Jones et al., 2006). One method by which perceptions of certainty of apprehension can be increased would be conducting special operations or “blitzes” that involve highly publicised and highly visible enforcement operations. An additional benefit of such “blitzes” would be an increased awareness level of roadside saliva based operations. The severity of sanctions is another factor that could be manipulated by authorities. However, increasing the severity of penalties is not likely to have a deterrent effect unless an increase of certainty of apprehension occurs also (Homel, 1988; Nichols & Ross, 1988).

Future research should seek to examine changes in perceptions of deterrence over time with the development of the ACT’s roadside oral fluid screening program. Researchers will need to be mindful of the impact of expansions of the program and increased media awareness on perceptions of apprehension certainty. Additionally, given the paucity of deterrence based research examining drug driving according to gender, future research is needed in this area. Results of the current study suggest few significant differences between genders, whereas previous work suggests otherwise (e.g., Watling et al., 2010). As such, further examinations are needed to clarify these incongruities.

5. Conclusion

The current research sought to examine the impact of recently introduced roadside oral fluid screening in the Australian Capital Territory (ACT). Overall, results appeared to suggest a decline in drug driving since the introduction of roadside drug testing among those most prone to engaging in the behaviour. Given the recency of these operations, however, a large number of drivers were unaware of roadside oral fluid screening and an even larger proportion did not perceive a high certainty of being apprehended for drug driving. Results indicated an increased likelihood of future drug driving among younger drivers and drivers whom had either direct or vicarious experiences with avoiding punishment avoidance for drug driving. Although the majority of drug drivers in the current sample were males, few other significant differences were found with regards to gender. With the increase of media exposure to enhance awareness, and the number of roadside drug testing operations in the ACT, further research is warranted to closely monitor the impact of this critical road safety strategy.

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