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Drugs in Oral Fluid:
Illicit Drug Use and Drug Driving in a Sample of Gold Coast Motorists

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Abstract

The present study examined the prevalence of drug driving in a sample of Queensland drivers. Oral fluid samples were collected from 276 drivers who volunteered to participate at Random Breath Testing (RBT) sites in the area of the Gold Coast, Queensland. Illicit substances tested for included cannabis (delta 9 tetrahydrocannibinol [THC]), ecstasy (MDMA), amphetamines and cocaine. Drivers also completed a self-report questionnaire regarding their drug-related driving behaviour. Oral fluid samples from 9 participants (3.3%) were found to be positive for at least one illicit substance. The most common drugs detected in oral fluid were cannabis (n = 6) followed by amphetamines (n = 3). A key finding was that cannabis was also confirmed as the most common self-reported drug combined with driving and that individuals who tested positive to any drug through oral fluid analysis were also more likely to report the highest frequency of drug driving. This research provides preliminary evidence that drug driving may be relatively prevalent on Queensland roads. This paper will further outline the major findings of the study and present possible directions for future drug driving research.

INTRODUCTION

In recent times, drug driving has become an escalating issue in road safety. An increasing amount of research has focused on ascertaining the incidences of drug driving and the impact on road safety. For example, a considerable body of literature is accumulating that has focused on detecting the presence of drugs in body fluids of those who have been involved in a crash (de Rio et al. 2002; Drummer et al. 2003). It has been shown that drug use among this group is anywhere between 8.8% and 39.6% for those who have been fatally injured (Del Rio et al. 2002; Drummer et al. 2003; Gjerde, Beylich and Morland 1993; Mura et al. 2006; Seymour and Oliver 1999; Swann, Boorman and Papafotiou 2004). Historically, the predominant illicit drug found in the systems of the majority of such drivers is cannabis. This trend of cannabis use is also prevalent among crash-involved, but non-fatally injured drug drivers, as the proportion of illicit substances (including the predominant substance of cannabis), among this group has also been found to be between 2.7% and 41.3% (Athanaselis et al. 1999; Longo et al. 2000; Soderstrom et al. 1995; Stoduto et al. 1993; Waller et al. 1997).

Additionally from this data, research has found a strong association between drug driving and culpability, with accident risk for illicit drug drivers estimated to be as high as a driver with a blood alcohol content of 0.1 to 0.15% (Drummer et al. 2003). However, extrapolating further from this data for an indication of the extent of drug driving among the greater driving population is a difficult task (Drummer et al. 2004), as drivers judged at fault in an accident are naturally more likely to be drug tested, and therefore also more likely to appear in official statistics of this nature. Again, this provides challenges in capturing an accurate community-wide picture of drug driving.

With a view towards the illicit drug use of drivers in general, beyond those involved in crashes, there is less population-wide data readily available. Historically, the prevailing view of drug

driving in the community is that it is relatively uncommon amongst the general driving population (Kelly, Darke and Ross 2004). However, a growing body of research has indicated that the self-reported prevalence of drug driving varies markedly between 2% and 90% of respondents, although most research suggests between 3% and 10% (Kelly, Darke and Ross 2004). Despite this, among some subcultures, researchers have indicated the percentage of drug driving may be much higher. For example, amphetamine use among some samples has been found to be 62% (Akram 1997), while drug driving among a sample of cannabis users has been reported to be approximately 82% (Terry and Wright 2005). Research has generally indicated that the most common drug combined with driving is usually cannabis (Davey, Leal and Freeman 2007; Drummer et al. 2003; Terry and Wright 2005), which may in part be associated with perceptions that cannabis does not have a negative impact on driving performance (Terry and Wright 2005). However, it is also noted that amphetamine use and driving are also frequently combined among some sub-groups of motorists (Albery et al. 2000; Darke, Kelly and Ross 2004; Davey, Leal and Freeman 2007).

Within Australia, a large contemporary questionnaire-based study of 6801 drivers revealed that 12.3% of the sample reported driving within 3 hours of using cannabis in the past 12 months (Mallick et al. 2007). Smaller Australian studies that have focused on young drivers (e.g., university students) have also revealed similar results, with between 8.2% and 15% of motorists reporting driving after consuming some form of illicit substance on a yearly basis (Armstrong, Wills and Watson 2005; Davey, Davey and Obst 2005). A three-year study of police traffic detainees in three Australian states found that 70% tested positive to one drug and approximately one third (e.g., 38%) tested positive to more than one drug (Poyser et al., 2002). A similar Australian study that examined motorists involved in traffic accidents revealed that 16.4% of injured drivers tested positive to tetrahydrocannabinol (THC) and 6.9% tested positive to amphetamines (Caldicott et al. 2007).

Recently, the development and use of oral fluid drug testing methods for roadside use has provided an additional source of information to determine the prevalence of drug driving, as sample collection is relatively simple and non-invasive (Dolan, Rouen and Kimber 2004; Speedy et al. 2004). Research concerning body fluid samples has traditionally focused on samples of drivers alleged to have been driving under the influence of drugs and/or those involved in vehicle crashes. However, in addition to this source, research has commenced focusing on random roadside drug testing to provide another estimate of the extent of drug driving on public roads, including those who are not involved in crashes. An earlier oral fluid study reported 4.7% of drivers from a random sample of non-crash drivers were confirmed positive to the presence of drugs in the United Kingdom (Buttress et al. 2004), while a German study identified illicit substances in 16.8% of a sample of motorists (Wylie et al. 2005).

One of the first Australian studies was implemented by the Victorian police force who recorded a drug driving prevalence rate of one driver in 40 (2.4%) for cannabis, ecstasy and amphetamines, which is more than double the positive alcohol-driving rate (Drummer et al. 2007). In addition, Davey, Leal and Freeman (2007) also examined the prevalence of drug driving in Townsville (Queensland) and reported 3.5% of the sample tested positive to one illicit substance, which was again greater than the detection of drink drivers during the same testing period (0.8%). As noted previously, an even larger detection rate was reported in a three-year study of police traffic detainees in three Australian states, as the researchers reported that 70% tested positive to one drug and approximately one third (38%) tested positive to more than one drug (Poyser et al., 2002). While these studies are not necessarily random, the findings nonetheless indicate that drug driving presents as a serious threat to road safety, and additionally prompts the need for further research to determine the prevalence of non-crash drug driving rates in Australia, especially for drugs such as cannabis, amphetamines, ecstasy and cocaine.

As a result, the major objectives of this study were to:

- Measure the prevalence of drug driving among a sample of Queensland drivers in the city of the Gold Coast; and
- Investigate the self-reported frequency of general motorists' involvement in drug driving behaviour.

METHOD

Participants, Materials and Procedure

Drivers stopped at Random Breath Testing operations across a large area of the Gold Coast, Queensland, were approached and asked by operational police to participate in the drug driving research, which was positioned on average 100 metres further down the road. Participation was voluntary and involved completing a self-report questionnaire (in the researchers' presence) regarding recent illicit drug use and drug driving in the previous 12 months, and providing a sample of oral fluid that could later be screened for the presence of drugs. The procedure took approximately 10-20 minutes to complete and drivers received a one-off payment of $20 cash to reimburse them for their time. Data was collected over a two month period, on ten separate occasions on Friday and Saturday nights, usually between the hours of 5pm and 1am[1].

A 12 item self-report questionnaire was designed to assess a variety of demographic data (e.g., gender, age, years driving) as well as self-reported drug use and the frequency of drug driving behaviour. Participants responded to questions that investigated the most recent use of marijuana / cannabis (within four hours, within the last 24 hours, within the last week, within the last month, within the last year, more than a year ago, have never used). This question was repeated for meth / amphetamines (such as speed, oil, base, and crystal), ecstasy, heroin and cocaine. Participants were also required to indicate how often in the previous 12 months they had operated a motor vehicle (including a motorcycle) within four hours of using marijuana /

[1] Workplace health and safety requirements resulted in the current roadside project only being implemented with the presence of the Queensland Police Service. RBT operations were deemed to be the most compatible roadside activity and thus drug testing procedures corresponded within traditional RBT operational hours e.g., 5pm – 1am.

cannabis (every day, more than once a week, about once a week, 11 – 20 times, 3 – 10 times, once or twice, never). Once again, this question was repeated for meth / amphetamines (such as speed, oil, base, and crystal), ecstasy, heroin and cocaine. The majority of the data was descriptive and/or categorical, and recorded as percentage frequencies, and thus, chi-square tests were performed where appropriate.

In addition, oral fluid samples were collected, stored and screened off-site at a later date using the Cozart® RapiScan oral fluid drug test device. Participants provided a sample of oral fluid that was collected from inside their mouth via a pad held either under their tongue or beside the inside of their cheek. The five-panel cannabis and single-panel methamphetamine / MDMA test cartridges were used (i.e. each sample was screened twice). Each Cozart® RapiScan kit consisted of a collector, transport tube containing buffer solution, separator filter tube, pipette and test cartridge. The five-panel cannabis cartridge detected the presence of benzodiazepines, amphetamines, cannabis (THC), and cocaine, while the single-panel methamphetamine / MDMA cartridge detected the presence of methamphetamine and MDMA (ecstasy). There was no subjectivity in the interpretation of results as the Cozart® RapiScan testing instrument displayed and printed results.

RESULTS

Sample and Response Rate

A total of 276 motorists in the Gold Coast area volunteered to participate in the study. As a result of resourcing restrictions and the referral procedure from the Police RBT location, it was difficult to acquire an accurate measurement of the proportion of responses over the entire data collection stage[2].

[2] The procedure usually consisted of RBT operational police officers informing motorists (who had given a breath sample) that they had the opportunity to participate in an anonymous research drug driving project being conducted approximately 100 metres down the road.

More than half the participants were male (*n* = 183, 66.3%). Participants' ages were between 17 and 68 years (mean age = 28.07 years, *SD* = 11.03). There were 8 participants that did not indicate their gender. On average, participants had been driving for 11.03 years (*SD* = 10.03). The majority of the participants reported driving daily (*n* = 241, 87.3%) followed by three to five times per week (*n* = 27, 9.8%).

Prevalence of Positive Drug Tests

Drug screening tests revealed that oral fluid samples from 9 drivers (3.3% of the total sample) contained at least one illicit substance. Table 1 outlines the results by drug group detected and gender of the driver. As depicted in Table 1, the most common drug detected was cannabis followed by amphetamines, while samples from 4 participants were consistent with polydrug use.

The 9 drivers who provided samples that were confirmed positive for at least one illicit substance were male (*n* = 9, 100%), and aged between 17 and 29 (mean = 23.1 years, *SD* = 3.85). In addition, this group had less driving experience than the sample average (mean = 6.6 years, *SD* = 4.37). However, frequency of driving was similar for the two groups, with all participants that were screened positive for any illicit drug reported driving daily (*n* = 9, 100%).

INSERT TABLE 1 HERE

Self-reported Prevalence of Drug Driving

In addition to the analysis of body fluids, an investigation was also undertaken to examine participants' self-reported drug use and drug driving behaviours. Firstly for drug use, the most commonly consumed drug was cannabis, with 28.4% reporting the use of the substance within the last year, and 9.1% of this group reporting usage in the last week. Frequency of use for ecstasy and amphetamines was similar with 18.8% reporting the use of ecstasy within the last

year, and 4.3% reporting use in the last week, whilst 16.7% reported using amphetamines within the last year and 4.0 % used the substance in the last week. Finally, 8.7% reported using cocaine and 0.4% of the sample reported using heroin during the last year. Chi-square analysis revealed no significant gender differences for reporting regular use of cannabis, while small cells sizes precluded analysis of the other substances.

For drug driving, similar to the above findings, the most common substance combined with driving was cannabis followed by ecstasy (see Table 2). More specifically, 4.7% reported using cannabis and 2.2% reported using ecstasy before driving at least once a week. Less than 1.5% reported using amphetamines, cocaine and heroin before driving at least once a week. Finally, examination of the self-reported drug use for the 9 individuals who tested positive to the presence of drugs revealed that drug driving was most common among these individuals, although the small sample size limits meaningful comparisons. Nonetheless, 7 (77.8%) reported driving within four hours of using at least one of the drugs outlined on the questionnaire.

INSERT TABLE 2 HERE

DISCUSSION

This paper aimed to report on an investigation into the prevalence of drug driving in the Queensland tourist city of the Gold Coast. Specifically, the study focused on measuring the self-reported prevalence of drug driving in the area, as well as the major drug types that may be used when driving.

Prevalence of Positive Drug Tests

The first major finding of the study was that 3.3% (*n*=9) of the oral fluid samples provided a positive illicit drug reading. The finding is consistent with the small amount of preliminary Australian research that has focused on randomly drug testing motorists through oral fluid

analysis (Davey et al. 2007; Drummer et al. 2007). In addition, the detection rate for drug drivers (in the current case) appears higher than the corresponding detection rates for drink drivers in Queensland (Davey et al. 2007; Freeman and Watson 2006). However, it is noted that these findings are only preliminary and the data sample for the current study focuses specifically on a large tourist city. Nevertheless, the results suggest that a notable proportion of motorists drive under the influence of drugs, rather than alcohol, in the early hours of the morning.

In regards to the characteristics of the drivers most likely to test positive to illicit substances, the individuals were male and under 29 years of age. The results are again consistent with previous random roadside drug testing research in Queensland (Davey, Leal and Freeman 2007) as well as general drug research that has consistently indicated that males are more likely to consume illicit substances than females (Begg and Langley 2004; Neale 2004), and in particular, engage in poly drug use (Milani et al. 2004).

In regards to the identified substances, four types of drugs were detected: (i) cannabis (delta 9 THC), (ii) amphetamines (iii) ecstasy and (iv) cocaine. Firstly, cannabis was the most common illicit substance identified in the current sample. This finding is consistent with self-report research that indicates cannabis is also most often combined drug with driving (Davey et al. 2007; Drummer et al. 2003; Terry and Wright 2005), although it is noted that drug detection rates may prove to vary with specific locations. Additionally, it is noted that the sample size as well as the differences identified between the different drug types was relatively small, and thus the findings need to be replicated with larger sample sizes.

Self-reported Prevalence of Drug Driving

Examination of the self-reported data revealed that cannabis was also the most frequently consumed illicit substance, and not surprisingly, was also the most frequent drug to be used when driving. The findings again support previous research that has indicated cannabis is the

most prevalent drug associated with driving (Davey et al. 2007; Drummer et al. 2003; Seymour and Oliver 1999; Swann et al. 2004). Furthermore, individuals who tested positive to the drug testing process also reported the highest rate of drug driving. Importantly, these findings indicate that there appears to be some level of congruency between the self-reported and oral fluid data. Additionally, the findings also provide preliminary evidence that positive drug testing outcomes highlight individuals at risk of regularly engaging in drug driving, and to a lesser extent, provide support for the reliability of the self-report data (Davey et al. 2007).

A number of methodological limitations associated with the study should be borne in mind when interpreting the findings. The results of the study are not necessarily generalisable, as the data was sampled from a specific tourist area of Queensland (e.g., Gold Coast), and it is likely that drug use (and therefore, drug driving trends) may vary by area due to factors associated with supply, demand and cost of the drugs. Further, although a wide age range was observed, the sample was skewed towards younger age groups (M = 28 years) and additionally, the sample size is quite small. Importantly, the sample of this study may prove to be representative of drivers at night on weekends, which may be a peak drug driving period. However, given that data was only collected between the hours of 5pm and 1am, it is possible that drug driving rates may increase or decrease further into the early hours of the morning, as well as during the day. Furthermore, the possibility of self-report and volunteer bias remains, and although the Queensland Police Service were not directly involved in the research project, it is possible that operational officers' presence at the research site deterred some individuals from participating (specifically those under the influence of drugs). Additionally, it would have been ideal to have measured the number of motorists who were tested at the RBT sites during the study period so as to compare (and obtain a ratio) of drink drivers to drug drivers, and future research should include such an approach.

Despite such limitations, this study has provided evidence that drug driving may be prevalent in some areas within Queensland, and thus, drug driving may currently present as a serious threat

to road safety. The recent introduction of the random roadside drug testing legislation in Queensland appears to be an important and necessary step in attempting to combat drug driving. Considering that previous research has indicated that perceptions of apprehension certainty are a key element in deterring both drink drivers (Piquero and Pogarsky 2002) and drug drivers (Davey, Davey and Obst 2005) from engaging in such offending behaviours, the implementation of the new detection method has the potential to impact on the prevalence of drug driving. In addition to determining the effectiveness of the countermeasure to apprehend offending motorists, it may prove beneficial for further research to examine motorists' current perceptions regarding the likelihood of being detected for drug driving, and their corresponding beliefs about the effectiveness, and impact of saliva testing on offending rates. Such information would provide additional information regarding the most effective methods to implement and reinforce the deterrent element of random roadside drug testing. Taken together, further investigation into the prevalence, type, impact and prevention of drug driving can only assist with the development and implementation of effective countermeasures and supportive enforcement practices aimed at reducing the burden of drug driving on road safety.

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Tables

Table 1
Number and Proportion of Participants Testing Positive by Drug Group

	Total[3] ***N* = 276**	**Males** ***N* = 183**	**Females** ***N* = 85**
Cannabis (THC)	6 (2.2%)	6 (3.3%)	0 (0.0%)
Amphetamines	3 (1.1%)	3 (1.6%)	0 (0.0%)
Cocaine	2 (0.7%)	2 (1.1%)	0 (0.0%)
Ecstasy (MDMA)	2 (0.7%)	2 (1.1%)	0 (0.0%)
Total illicit substances[4]	13 (4.7%)	13 (7.1%)	0 (0.0%)

Table 2
Drug Driving Behaviour

Drug Type	Cannabis		Amphetamines		Ecstasy		Cocaine		Heroin	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Drug Driving										
Every day	6	(2.2)	0	(0.0)	1	(0.4)	0	(0.0)	1	(0.4)
More than once week	4	(1.4)	4	(1.4)	1	(0.4)	0	(0.0)	0	(0.0)
About once a week	3	(1.1)	0	(0.0)	4	(1.4)	2	(0.7)	0	(0.0)
11 - 20 times	3	(1.1)	5	(1.8)	4	(1.4)	2	(0.7)	0	(0.0)
3 - 10 times	5	(1.8)	3	(1.1)	3	(1.1)	2	(0.7)	0	(0.0)
Once or twice	15	(5.4)	0	(3.6)	16	(5.8)	12	(4.3)	1	(0.4)
Never	238	(86.2)	253	(91.7)	246	(89.1)	257	(93.1)	273	(98.9)

[3] 8 respondents did not provide their gender.
[4] 4 respondents screened positive to more than one drug.