Short report

Alcohol and drug use by Spanish drivers: Comparison of two cross-sectional road-side surveys (2008–9/2013)

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Introduction

Driving under the influence of substances (DUI) other than alcohol has been the subject of increasing interest over the past few decades (Schulze et al., 2012). As with alcohol, research has shown that drug intake increases the risk of road traffic accidents (Elvik, 2013; Schulze et al., 2012; Verstraete & Legrand, 2014). Intervention in this area is a priority. A key factor for deterring DUI is to convince drug-using drivers that the risk of detection is high (Jones, Donnelly, Swift, & Weatherburn, 2006; Watling, Palk, Freeman, & Davey, 2010) thus, adequate law enforcement, and the continuity of roadside testing for drug use among drivers, play an important role (Shepherd, 2001; Watson & Freeman, 2007).

For the European Project DRUID (Driving under the Influence of Drugs, Alcohol and Medicines; http://www.druid-project.eu), roadside surveys were conducted in 13 European countries and results showed large differences in the prevalence of alcohol and drug intake by country (Schulze et al., 2012). The highest prevalence was found in Southern Europe (Italy, Spain and Portugal). In Spain, avoiding driving after alcohol or drug use has been recognized as crucial to improving road safety. Five years after the DRUID project, a new roadside survey was conducted following a similar methodology in order to study whether the use of alcohol and drugs among Spanish drivers had changed.

Methods

The survey target population was motor vehicle drivers, excluding bikers and drivers of vehicles over 3500 kg, on Spanish public roads. The prevalence of drivers under the influence of substances was compared using results of two cross-sectional studies conducted in 2008–9 (time 1) and 2013 (time 2) in separate representative samples of the general population of Spanish drivers. Drivers were selected at random from the total population of drivers using a sampling scheme stratified by country areas, time period, population size, and road type, following DRUID criteria as previously described (Gómez-Talegón et al., 2012). A total of 128 police roadside checkpoints were selected. The data were weighted according to the traffic intensity at each checkpoint. The study included a total sample size of 6234 drivers: 3302 at time 1 (with samples taken between September 26th, 2008 and August 24th, 2009) and 2932 at time 2 (with samples taken at two different time periods, May and November). In Spain, roadside police controls are legally regulated. Alcohol test and on-road saliva analysis are both mandatory. Refusal to be tested has the same penalty as a positive test (1000 euros fine and a loss of 6 driver points). Therefore, no drivers refused to participate. However, in 20 cases in 2008–9, the driver was either unable to produce enough saliva to carry out the drug test or there was an error with the device being used. In 2013, five drivers were unable to produce enough saliva to test.

Substances analyzed and toxicological aspects

Roadside police controls used mandatory alcohol tests and on-road saliva analysis. Breath tests for alcohol were carried out using the Dräger Alcotest® 6810 device and an on-site oral fluid drugs test (screening), with the Dräger Drug Test® 5000 analyzer (Dräger, 2015). Identical (having the same technical specifications and cut offs) (Gómez-Talegón et al., 2012) test kits were used at time 1 and 2 for multiple and simultaneous detection of amphetamines, methamphetamines, opiates, cocaine, cannabis and benzodiazepines. The oral fluid samples used in the confirmatory analysis were collected with the StatSure™ Saliva•Sampler™ for the first group of samples (time 1) and with Quantisal™ in the second (time 2). The Statsure and Quantisal devices contained 1.0 and 3 ml of buffer respectively. The collected volumes of oral fluid were determined for each sample by weight. Drug concentrations in undiluted oral fluid were calculated by considering oral fluid density as 1 g/ml (Concheiro, de Castro, Quintela, Cruz, & López-Rivadulla, 2008). The analyses were carried out at both times by the University of Santiago de Compostela. The storage and cooling process, transportation and

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Table 1
Analyzed substances and cut-off concentrations in native oral fluid determining positivity according to DRUID criteria (Gómez-Talegón et al., 2012).

Substance	Oral fluid analytical cut-off (ng/ml)	Breath (mg/L)
Ethanol	–	0.05
6-Acetilmorphine	16.0	
Alprazolam	3.5	
Amphetamine	360.0	
Benzoilecgonine	95.0	
Clonazepam	1.7	
Cocaine	170.0	
Codeine	94.0	
Diazepam	5.0	
Flunitrazepam	1.0	
Lorazepam	1.1	
MDA	220.0	
MDEA	270.0	
MDMA	270.0	
Metadone	22.0	
Metamphetamine	410.0	
Morphine	95.0	
Nordiazepam	1.1	
Oxazepam	13.0	
THC	27.0	
Zolpidem	10.0	
Zopiclone	25.0	
Tramadol	480.0	
7-Amino-clonazepam	3.1	
7-Amino-flunitrazepam	1.0	

subsequent analysis in the laboratory has previously been described (Gómez-Talegón et al., 2012). At time 2, only the samples of drivers testing positive in the screening were later analyzed in the laboratory. Consequently, the variables at time 1 were recodified following the same criteria. Samples were categorized as "negative" when the drivers' results were negative in the screening test. For both studies, a final positive result was defined as a concentration higher than the cut-offs established in the DRUID project for any of the analyzed substances in the laboratory, or having a breath alcohol concentration of >0.05 mg/L (Table 1).

The positives in the screening were defined in terms of four dichotomous variables (yes/no): "only alcohol", "only drugs", "alcohol and drugs" and "any substance". Regarding confirmatory analysis, two variables were considered: "any substance" (yes/no) and a categorical variable with nine groups: negative/THC positive/ cocaine positive/amphetamine positive/opiate positive/alcohol positive/benzodiazepine positive/positive for a combination of drugs/alcohol + drug positive.

Statistical analyses

Absolute and relative frequencies with 95% confidence intervals (CIs) are shown. The two-tailed two-proportion *z*-test was used to determine whether the difference between two proportions was significant. Statistical analyses were carried out with the Statistical Package for the Social Sciences (SPSS, v19). The level of significance was set at $p \leq 0.05$.

Results

At time 2, 12.07% of the on-road traffic controls tested positive for alcohol and/or drugs in the screening test, which shows a decrease of 4.27 points compared with time 1 (16.34% Table 2). At time 2, cases testing positive for both alcohol and drugs were also less frequently observed. Compared to time 1, there was a decrease in the prevalence of cases testing positive for alcohol (and negative for drugs) as well as cases testing positive for drugs (and negative for alcohol).

At time 2, 9.34% of cases were confirmed to have some substance present compared to 14.05% at time 1, indicating a decrease of 4.71 points (Table 2). A decrease was observed in the prevalence of cases testing positive for alcohol and drugs from 2008–9 to 2013. Upon analyzing the different combinations of substances, differences were observed in the cases testing positive only for alcohol, alcohol and drugs (Table 2), and for drugs without the presence of alcohol or medicines (time 1: 6.93% [6.07–7.80]; time 2: 4.87% [4.09–5.65]; $p < 0.01$). The decrease in the prevalence of drugs was due to the less frequent presence of cannabis, while prevalence of the other categories of illegal drugs showed no change (Table 2).

Discussion

The results show that the presence of alcohol, drugs, and medicines continues to be frequent among tested Spanish drivers. However, data from 2013 clearly show a decrease in the prevalence of cases that tested positive for alcohol and/or drugs on the roadside screening test (a decrease of 4.27 points, or a decrease of 26.13% with respect to 2008–9) as well as in the laboratory test

Table 2
Results of the screening tests, confirmation of the presence of drugs in oral fluid, and breath alcohol concentration (roadside surveys 2008–9 and 2013).

	Roadside survey 2008–9 (n = 3302)		Roadside survey 2013 (n = 2932)		Test *z*; *p*
	n	% [95% CI]	*n*	% [95% CI]	
Screening					
Negative	2763	83.66 [82.40–84.92]	2578	87.90 [86.72–89.08]	4.744; *p* < 0.0001
Total positive for alcohol or drug screening	539	16.34 [15.08–17.60]	354	12.07 [10.92–13.28]	4.744; *p* < 0.0001
+alcohol/−drug screening	151	4.58 [3.86–5.29]	97	3.30 [2.66–3.95]	2.485; *p* < 0.05
−alcohol/+drug screening	321	9.73 [8.72–10.74]	233	7.96 [6.98–8.94]	2.413; *p* < 0.05
+alcohol/+drug screening	67	2.03 [1.55–2.51]	24	0.81 [0.48–1.13]	3.872; *p* < 0.0001
Results of confirmatory analyses					
No substance	2838	85.95 [84.71–87.09]	2658	90.65 [89.66–91.76]	5.702; *p* < 0.0001
Substance	464	14.05 [12.91–15.29]	274	9.34 [8.24–10.34]	5.702; *p* < 0.0001
Cannabis (THC)	174	5.28 [4.51–6.04]	92	3.13 [2.50–3.76]	4.094; *p* < 0.0001
Cocaine	42	1.28 [0.90–1.67]	26	0.87 [0.54–1.21]	1.339; *p* > 0.05
Amphetamines	2	0.06 [0.00–0.15]	4	0.12 [0.00–0.25]	0.555; *p* > 0.05
Opiates	5	0.14 [0.01–0.27]	1	0.03 [0.00–0.09]	1.082; *p* > 0.05
Alcohol > 0.05	162	4.92 [4.18–5.66]	100	3.41 [2.27–4.07]	2.874; *p* < 0.05
Benzodiazepines	5	0.17 [0.03–0.30]	3	0.09 [0.00–0.20]	0.186; *p* > 0.05
Multiple drugs	18	0.55 [0.30–0.81]	26	0.90 [0.55–1.24]	1.457; *p* > 0.05
Alcohol + drugs	56	1.69 [1.25–2.13]	22	0.72 [0.42–1.04]	3.238; *p* < 0.05

confirmation (a decrease of 4.71 points, or a decrease of 33.52% with respect to 2008–9). Even with these favourable results, the prevalence of cases of drivers under the influence of alcohol and drugs is high, and highlights the need for continued intervention in this area.

From a practical point of view, the results of the screening tests are decisive when it comes to police procedure. In some countries, including Spain, when there is a case in which the alcohol screening has tested positive, there is usually no further drug testing. One can observe that in the 2008–9 and 2013 studies, the cases testing positive for alcohol are those that show a breath alcohol concentration of 0.05 mg/L or more. Nevertheless, the legal limit in Spain is 0.25 mg/L (0.15 mg/L in novel drivers). The 2013 data show a reduction in cases testing positive for alcohol, and in cases positive for alcohol and drugs.

The medicinal drugs analyzed were benzodiazepines, some hypnotic drugs, and some opioids. As a consequence, the information obtained in this study is limited to those specific pharmaceutical groups and only represents part of the problem of drivers under the influence of medicines. Benzodiazepines can be used in the treatment of mental disorders or can be used illicitly without a prescription. From a road safety perspective, these are two different problems. The presence of pharmaceuticals was detected in 24 drivers in 2008–9 and in eight drivers in 2013. Spain has introduced a pictogram for medicinal drugs, which informs the driver about a possible reduction in ability to drive safely when using those medicines (Fierro, Gómez-Talegón, & Alvarez, 2013). This pictogram is printed on the packaging of benzodiazepines, hypnotic drugs and opioids. In the context of the European DRUID project, medicines were categorized into four groups (Ravera et al., 2012). While illicit drugs are non-regulated substances, medicines are prescribed by physicians and dispensed by pharmacists with the possibility of receiving appropriate information regarding ability to drive. Finding a case testing positive to medication can raise issues for both the police and for government bodies. As a current policy, the Spanish government has decided not to include benzodiazepines in road drug testing.

This study has a number of limitations. Firstly, while the same design and selection criteria were used for both surveys, at time 1 the testing was carried out over an 11 month period, and at time 2, at two points in time, in May and November. National bank – holidays were taken into account at time 1 but not at time 2. The rationale for this was that analysis at time 1 revealed that bank holidays and month of year had no effect ($p > 0.05$) on the prevalence of positive cases. However, the different design at time 1 and 2 may have had an impact on the figures observed. Secondly, at both times the same testing criteria, cut-offs and confirmation processes were used. Saliva was collected with StatSure™ in time 1 and Quantisal™ in time 2 as the StatSure™ device had disappeared from the market by time 2 and the Quantisal™ device the best substitute. Although a lower recovery for the THC from the Quantisal™ device than from the StatSure™ device was observed (Langel et al., 2008), other studies have also found good recovery for THC from the Quantisal™ device (Quintela et al., 2006; Moore et al., 2006). In our case, all oral fluid samples (for time 1 and 2) were analyzed in the same forensic toxicology service laboratory at the University of Santiago de Compostela and they found the highest recovery for THC from the Quantisal™ device (Quintela et al., 2006). A decrease in the prevalence of drugs was observed, even when taking into account that the amount of drug recovered from the Quantisal™ device was probably higher than the StatSure™, especially for the THC. Thirdly, changes observed between time 1 and 2 could be related to changes in the prevalence of drug use among the population. Data from the Spanish national drug use surveys on the adult population (15–65 years old) are collated every two years, and there are data from 1995 to 2013

(PNSD, 2015). Figures on cannabis, do not show a clear trend between 2007 and 2013: lifetime use, 2007, 27.3%; 2009, 32.1%; 2011, 27.4%; 2013, 30.4%; past-month use 2007, 7.2%; 2009, 7.6%, 2011, 7.0%; 2013, 6.6%; daily use in the past month 2007, 1.7%, 2009, 2.0%, 2011, 1.7%; 2013, 1.9%. Regarding cocaine and stimulant drugs, there may be a decreasing trend in use over these years.

Although this study's design does not allow us to determine all the factors behind this decrease, the routine implementation of roadside drug tests may have been a contributing factor. As previously noted (DRUID, 2009, p. 11), "the experience of random testing in traffic in Victoria (Australia) showed that on-site screening devices have a good performance as a deterrent, leading to a marked decrease in the prevalence of THC, MDMA and methamphetamine, the three drugs which are covered in the states legislation". However, the deterrence effect depends on the frequency of testing as well as the context and may vary significantly with time (Watson & Freeman, 2007). Because of this, the deterrence effects of random drug testing and the legislative framework must be evaluated as well as their usefulness in promoting road safety.

Cannabis dependence and frequency of use have shown significant associations with DUI of cannabis (Jones et al., 2006). A key factor for deterring DUI is to convince drug-using drivers that their risk of detection is high (Jones et al., 2006). However, the severity of punishment does not produce a reduction in DUI of cannabis. A recent study in Victoria (Australia) suggested that interventions which address the risk associated with DUI may be beneficial, particularly those that emphasise the risk of motor vehicle crashes. Moreover, in this study, cannabis was noted as special case of intervention due to cannabis users' reluctance to change (Matthews, Bruno, Dietze, Butler, & Burns, 2014).

In 2010, legislative measures were introduced which established the validity of oral fluid (saliva) as biological evidence for testing and made the testing mandatory along with the consequent confirmatory analysis if the screening test were to be positive (Ley Orgánica 5/2010). In 2014, a new regulation (Ley 6/2014) has been introduced which, among other things, increased the fine to 1000 Euro (and a loss of 6 penalty points) for driving under the influence of drugs.

In conclusion, this study shows a decrease in the prevalence of cases testing positive for substances among Spanish drivers. Despite the marked decrease, detection of alcohol, drugs, and medicines among Spanish drivers remain common. Preventing driving under the influence of substances is a priority for road safety, particularly in Spain where new legislation (2014) was introduced to increase the fines for driving under the influence. The political priority given to drug driving in recent years has resulted in the extension of on-road drug testing. The data from the DRUID project shows that an extremely increased risk (relative risk 20–200) was observed among drivers with alcohol in blood ≥ 1.2 g/l and among those with alcohol in combination with drugs; we have observed a sensible decrease in alcohol + drugs between 2008–9 (1.69%) and 2013 (0.72%). The implementation of these measures in Spain has helped make driving under the influence of drugs less frequent.

Conflict of interest

Acknowledgements

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