Too drunk to ride? Insights on cyclists' behaviour and attitudes towards alcohol, drugs and cycling

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Abstract

The negative impacts of alcohol and recreational/illegal drugs on cyclist safety are well established. Like all road users, cyclists' psychomotor and cognitive skills are impeded when intoxicated, however, little is known about attitudes and use of alcohol and drugs among cyclists in Australia. We conducted an in-depth study of cyclists who had crashed and presented to two hospitals in Melbourne, Victoria (n=158). In this analysis, we investigated the prevalence and level of intoxication among cyclists. We also examined attitudes towards cycling when intoxicated or after having consumed recreational/illegal drugs. Clinical tests for alcohol were conducted on 23 cyclists (22 serum levels, 1 breathalyser). None of the participants were tested for recreational/illicit drug use. Of those tested, the majority of cyclists recorded zero levels of alcohol (73.9%); while 3 riders recorded a level of 0.05 or higher (2 records were missing). Participants were asked whether alcohol use would negatively affect riding skills and what level of alcohol was acceptable to ride a bicycle. The majority of participants agreed that cycling riding skills would be negatively affected by both alcohol (97.4%) and recreational/illegal drug (89%) use. The majority of cyclists (95.4%) believed an acceptable alcohol level to ride a bike was either no alcohol (40.4%) or low alcohol (under 0.05: 52.2%). However, 9% reported that they would ride a bike home if impaired by alcohol. Results highlight the need for more data be collected on alcohol and drug use amongst cyclists and that road safety campaigns that address substance use may need to target all road users, including cyclists.

Introduction

The negative impacts of alcohol and drug use on cyclist safety, particularly in relation to injury severity, is well established (Kraus, Fife et al. 1987, Olkkonen and Honkanen 1990, Li and Baker 1994, Li, Baker et al. 1995, McCarthy and Gilbert 1996, Kurzethaler, Wambacher et al. 2003, Rosenkranz and Sheridan 2003, Cummings, Rivara et al. 2006, Crocker, Zad et al. 2010). The physiological impacts of alcohol and drugs, alteration of senses, slowed reflexes, impeded psychomotor and cognitive skills, are the same, regardless of vehicle type (Li, Baker et al. 1996, Kurzethaler, Wambacher et al. 2003, Rosenkranz and Sheridan 2003). Alcohol intoxication in cyclists who crash has been strongly associated with greater injury severity and longer duration of hospital stay (Spaite, Criss et al. 1995). Not surprisingly, crashes involving alcohol are more likely to occur at night, when alcohol use is more likely, and visibility and road user cognition are likely to be limited (Ryan 1967, Rowe, Rowe et al. 1995, Andersson and Bunketorp 2002, Kurzethaler, Wambacher et al. 2003). For cyclists, the greater importance of balance and their physical vulnerability contribute to an increased risk of serious injury, that is exacerbated by alcohol and drug use (Olkkonen and Honkanen 1990).

The reported rates of alcohol and drug use among cyclists from crash data are varied. A report of over 10,000 cyclist crashes reported fewer than 2 percent of cyclists and drivers had used alcohol with drug use below 1 percent (Ryan 1967). While in Brazil, alcohol use was reported by 7.5 percent of commuter cyclists (Bacchieri, Barros et al. 2010). The use of drugs while cycling has been reported to be more likely amongst intoxicated bike riders (Andersson and Bunketorp 2002, Rosenkranz and Sheridan 2003).

Low rates of reported substance use may be due to low rates of testing, rather than lower rates of alcohol and drug use amongst cyclists compared to other road user groups. Alcohol and drug testing is often missing from post-crash data recorded in hospital and police reports (Cummings, Rivara et al. 2006). It is possible that costs associated with testing or a lack of suspicion of alcohol or drug use may be a deterrent. Prevalence may be markedly higher than is being reported, as cycling while intoxicated has not been considered a particularly serious matter by cyclists, despite the risk of serious injury (Andersson and Bunketorp 2002, Juhra, Wieskötter et al. 2012).

Alcohol

Alcohol is the most available drug to Australians and has been consumed by the majority of people aged 14 years and older (89.9%). It is the drug with the greatest acceptance rates for the offer or opportunity of use (AIHW 2008). Alcohol impaired driving is considered internationally to be a major risk factor for road trauma, evidenced by statutory limits placed on blood alcohol concentration (BAC) for drivers, typically 0.05% and zero for novice drivers (Schulze and Koßmann 2010). While a bicycle is legally a vehicle, it is not a motor vehicle and in Victoria, cyclists are not subject to the same BAC 0.05 limit as drivers and motor bike riders.

In Victoria, the law that relates to cyclists and alcohol use is the Summary Offences Act No. 7405, Section 16 (b) 'Drunk and in charge of a carriage'. In this law, bicycles are included as a 'carriage' along with a 'horse, cattle or steam engine'. In accordance with this law, cyclists cannot be breathalysed or be subjected to a blood alcohol test by police. Instead, intoxication is determined by a sobriety test where police observations determine drunkenness and cyclists are required to perform tasks including walking in a straight line, touching their nose, writing their name and counting backwards.

Intoxicated drivers pose a serious threat to all road users, including cyclists (Haworth and Schramm 2010). In Australia, there has been a concerted effort to reduce the number of people who drive with a BAC over 0.05%. In a review of cyclist fatality crashes in Australia (n=222), around 90 percent of tested drivers and cyclists had a BAC of zero. However in crashes when cyclists were hit from behind the influence of alcohol and drug use by drivers was identified as a contributing factor (Australian Transport Safety Bureau 2006).

International studies on the role of cyclist crashes and intoxication have reported varying behaviours and identified differing acceptance of BAC. In a Canadian study of cyclist-driver crashes, almost a third (30%) of drivers, who failed to see the cyclist, had signs of alcohol use (Rowe, Rowe et al. 1995). In China, there are judicial implications for increased BAC. A BAC of 0.02%-0.08% is considered the civil offence *driving after drinking*. A BAC of over 0.08% is considered the criminal offence *drunk driving*. In a study of cyclist fatality crashes in Shanghai (n=72), 18% of cyclists had a BAC of ≥0.02% and all alcohol-positive cyclists were male (Rao, Zhao et al. 2013). A US study of cyclist crashes reported that fatally injured cyclists were almost twice as likely to have a positive BAC and exceed the BAC limit as seriously injured cyclists (Li, Baker et al. 1996). Intoxicated cyclists were mostly male, aged between 20 and 39 years and crashes more likely to occur at night.

Some countries have a higher tolerance of alcohol use among cyclists. In Germany, BAC limits vary depending on vehicle type: 0.05% to drive a vehicle and 0.16% to ride a bicycle (Juhra, Wieskötter et al. 2012). In Münster, Germany where more trips are made by bicycle than by car, an increase in cyclist crashes in December is attributed to alcohol consumption at festive celebrations. While in Finland, it is not an offence to ride a bicycle while intoxicated unless the rider causes danger to another party (Airaksinen, Lüthje et al. 2010). Given this law, it is perhaps not surprising that a study of 216 cyclists who crashed and presented to a regional hospital, 31 percent of the crashes were alcohol-related.

While reducing the number of intoxicated drivers has long been a key element of Australian road safety strategies, a more recent focus has been on reducing the use of illegal or recreational drugs when driving. However, again, less attention has been given to drug use while cycling.

Drugs

The effects of drug use on driving is recognised as a major contributor road fatality crashes and serious penalties are imposed including licence suspension, recorded conviction (Vicroads 2013). However, the saliva test used at random roadside testing stations on drivers are rarely used on cyclists. Attention on drugs in cycling is typically related to performance enhancing drug use in elite cyclists (Mottram 2001, Noakes 2004). Less attention has been given to the use of recreational/illicit drugs by the general public when they ride their bikes.

Despite this lack of attention, the use of drugs while cycling has been shown to be a significant contributing factor to injury. The likelihood of a cyclist sustaining serious injuries when impaired increases by 374.5 percent if he or she is under the influence of drugs (Ryan 1967).

In a review of Australian cyclist fatality crashes (n=222), drug tests were conducted for 15 cyclists and 14 returned positive results (Australian Transport Safety Bureau 2006). Positive test results were considered a reflection of the circumstances of the 15 cyclists tested, rather than being representative of all cyclists killed. Most drivers were not tested for drugs and 'few' recorded a positive result. However there were signficant omissions in the report with no details provided on the types of drugs tested for, the number of drivers who tested postive or the types of drugs detected in cyclists and drivers.

In some sections of the Australian population, illicit drug use is increasingly considered normal. A third of Australians have used marijuana (33.5%) and in 2007, the most commonly used drugs were marijuana (9.1%), ecstasy (3.5%) and meth/amphetamines (2.3%)(AIHW 2008). Research at music festivals and nightclubs in Australia have reported that drugs, in particular marijuana, ecstasy and amphetamines are easily obtained with a high correlation reported between accessibility and use (Wilson, Bryant et al. 2010, Fitzgerald, Mazerolle et al. 2013). However, less is known about the prevalence of illicit drug use and attitudes in relation to cycling.

Study Aims

While there is clear evidence that cyclists' psychomotor and cognitive skills are impeded when intoxicated, little is known about attitudes and use of alcohol and drugs among cyclists in Australia. The aim of this study was to address this gap in knowledge through analysis of in-depth data on cyclists involved in a crash.

Methods

Interviews were conducted with a sample of cyclists who had presented to the Alfred or Sandringham Hospitals in Melbourne following a crash while riding their bicycle. Data collection was from November 2010 to November 2011.

Participants

Potential participants were identified from emergency department triage reports that were screened weekly for the word 'bike' or 'bicycle', excluding 'motorbike/ motorcycle'. All cyclist crash types were eligible and while there was no age criterion, young children were only included if a reliable witness observed the crash. Exclusion criteria were: motorised bicycles, cyclist fatality crashes and hospital presentation for medical reasons not related to the bicycle crash. Third party interviews

were not conducted. Participation was voluntary and no incentive was offered. Study protocols were approved by the Human Research Ethics Committees of Alfred Health and Monash University.

Interviews were conducted after the participant was discharged from the emergency department, or from the hospital if the participant had been admitted. The reasons for the delay were: 1) many participants were treated at the emergency department where there was potential for pain, emotional distress and the sedative action of strong analgesics, all of which would work against timely and accurate information gathering; 2) the interview could take up to 45 minutes and frequent disruptions in an emergency department for urgent investigations and procedures could lead to prolonged and unworkable interviews.

Interviews

The interview schedule was adapted from the motorcyclist module of the Australian National Crash Investigation Study (ANCIS). The module was revised for cyclists using expert knowledge and key stakeholder workshops with representatives from state and local government, cycling advocacy groups (Amy Gillett Foundation, Australian Bicycle Council, Beach Road Cyclists, Bicycle Network Victoria, CycleSport Victoria) cycling experts and sporting groups (for more details, see (Biegler, Newstead et al. 2012)). In total, 97 questions were used that included: personal details, bicycle riding experience, clothing details, events leading up to the crash, the road environment, crash details, injury details and toxicology data. Interviews were conducted face to face or via phone.

Data analysis

In this study, we analysed interview questions related to the use and attitudes towards alcohol and drugs, specifically: 1) cyclist's alcohol reading from the medical records; 2) attitude about the potential of alcohol to negatively affect riding skills (yes, no, declined); 3) BAC level considered acceptable when riding a bicycle (none, under 0.05, over 0.05, declined); 4) usual mode of transport to get home if impaired by alcohol (taxi, public transport, ride bicycle, walk, drive, other); 5) attitude about the potential for recreational/illicit drugs to negatively affect riding skills (yes, no, declined); 6) belief that some recreational/illicit drugs may affect riding more than others (yes, no, declined); 7) types of drugs that would affect riding skills (open-ended).

While a BAC of 0.05 does not legally apply to cyclists in Victoria, it is the legal limit for other road users and is used as a proxy for intoxication amongst cyclists in this study. Consumption of recreational/illicit drugs is illegal, therefore measurement of any illicit drugs following a bicycle crash is an infringement.

Participant characteristics (gender, age, driver licence status) and cycling frequency, BAC test status and helmet use are summarised using descriptive statistics (Table 1) and cross-tabulated with the participants' attitudes whether alcohol would impact their ability to cycle. While drug tests are conducted on people who present at hospitals in this study, none of the participants were tested.

Typical modes of transport used to get home when impaired by alcohol were summarised using descriptive statistics and cross-tabulated with attitude about the effect of alcohol on riding skills (Table 2). Cyclist characteristics and injury circumstances were then compared between cyclists who had been tested for alcohol and compared with cyclists who had not been tested and the Chi-square tests were conducted on the comparisons. The factors compared included: gender, age, driver's licence status, location of crash, time of crash, single vehicle crash, multiple vehicle crash, day of the week, injury severity and helmet use.

Due to the low number of cyclists who recorded a positive BAC result, details are included as case

studies. Results related to drug use and attitudes towards drug use are also discussed. All statistical analyses were conducted using SPSS Version 18. Statistical significance was set at $p < 0.05$.

Results

In total, 158 cyclists who had crashed and presented to the Alfred or Sandringham Hospital were interviewed. The majority of respondents recorded a BAC under 0.05 and no participant was tested for recreational/illicit drug use.

Participant characteristics

The majority of participants agreed that drinking alcohol before riding a bicycle would negatively affect their cycling skills (97.4%).

Table 1. Participant characteristics, cycling experience and BAC test status by attitudes ("do you believe that drinking alcohol before riding a bicycle would negatively affect cycling skill") (n=158)

	Count	Percent	Attitudes			
			Agree	Disagree	Unknown	Percent agree
Total	158	100%	149	3	1	97.4%
Gender						
Male	117	74.1%	110	3	1	96.4%
Female	41	25.9%	39	0	0	100.0%
Age						
<18	6	3.8%	1	0	0	100.0%
18-25	13	8.2%	13	0	0	100.0%
26-40	57	36.1%	56	1	0	98.2%
41-60	74	46.8%	72	1	1	97.2%
>61	8	5.1%	7	1	0	87.5%
Driver's licence						
Yes	145	94.8%	141	3	1	97.2%
No	8	5.2%	8	0	0	100%
Cycling experience						
<1 year	8	5.1%	8	0	0	100.0%
1-5 years	13	8.2%	12	0	1	92.3%
6-10 years	17	10.8%	14	0	0	100.00%
11-20 years	35	22.1%	33	0	0	100.00%
>21 years	85	53.8%	82	3	0	96.4%
Blood alcohol test						
Tested	23	14.5%	23	0	0	100.0%
Not tested	135	85.4%	126	3	1	93.3%
Helmet use						
Yes	142	92.8%	140	1	1	98.5%
No	11	7.2%	9	2	0	81.8%

Behaviour when intoxicated

Participants were asked how they would travel home when intoxicated. Their response is cross-tabulated with their attitude about drinking alcohol affecting their riding skills (Table 2).

Table 2. Usual transport option taken to get home when impaired by alcohol by agreed alcohol affects riding skills

	Count	Percent	Alcohol affects riding skills
Taxi	88	58.6%	96.6%
Public transport	72	47.6%	100.0%
Bike	15	9.9%	93.3%
Walk	24	15.9%	100.0%
Drive	1	0.6%	100.0%
Designated driver/friend	34	22.5%	94.1%

BAC testing

In total, 23 participants (14.5%) were tested for alcohol consumption, 1 breathalyser and 22 serum levels. Table 3 is a summary of cyclist characteristics, crash circumstances, injury outcome and helmet use. Variables were cross-tabulated with participants' blood alcohol test status.

Table 3. Comparison of cyclist characteristics, crash circumstances, injury outcome and helmet use between cyclists who were tested for alcohol and cyclists who were not tested

	Cyclists tested for alcohol		Cyclists not tested for alcohol		P value
Variable	No.	%	No.	%	
Total	23	14.6%	135	85.4%	
Gender					
Male	18	15.3%	99	73.3%	0.61
Female	5	12.1%	36	26.6%	
Age					
<18	0	0	6	4.4%	
18-25	3	13.0%	10	7.4%	
26-40	5	21.7%	52	38.5%	0.02
41-60	11	47.8%	63	46.6%	
>61	4	17.3%	4	2.9%	
Driver's licence					
Yes	22	95.6%	123	91.1%	0.46
No	1	4.4%	12	8.9%	
Location					
On-road	20	86.9%	97	71.9%	
Off-road	3	13.1%	37	27.4%	0.30
Other	0	0	1	0.7%	
Time of crash					
Midnight – 6am (n=9)	3	13.0%	6	4.4%	
6am-10am (n=59)	11	47.8%	48	35.6%	0.29
10am-5pm (n=56)	5	21.7%	51	37.8%	
5pm-midnight (n=34)	4	17.4%	30	22.2%	
Single vehicle crash	15	65.2%	80	59.2%	0.05
Multiple vehicle crash	8	37.7%	53	39.3%	0.85
Day of the week					
Monday (n=23)	4	17.4%	19	14.1%	
Tuesday (n=23)	1	4.3%	22	16.3%	
Wednesday (n=17)	1	4.3%	16	11.9%	0.45
Thursday (n=20)	3	13.0%	17	12.6%	
Friday (n=13)	1	4.3%	12	8.9%	
Saturday (n=27)	6	26.1%	21	15.6%	
Sunday (n=35)	7	30.4%	28	20.7%	
Injury severity					
Minor, uncodeable	10	43.4%	73	54.1%	0.34
Moderate, serious, severe	13	56.6%	62	45.9%	
Helmet use					
Yes	20	86.9%	127	94.1%	0.21
No	3	13.1%	8	5.9%	

Age and single vehicle crash were the only comparisons with statistically significant differences. Older cyclists were more likely to be tested than younger cyclists and a higher proportion of single vehicle crashes were tested. While slightly more cyclists who were seriously injured were tested than not tested, the difference was not statistically significant.

Periods of high alcohol use, typically considered to be from late evening to early morning and over the weekend from Friday night to early Sunday morning, did not represent a significant proportion of the study crashes (3.8%). In fact, only a small proportion (6.3%) were reported at night/early morning time across the entire week. The most frequent crash time was morning peak travel times (7am-10am) in which almost a third (32.2%) of crashes occurred.

The majority of cyclists tested returned a zero BAC result with four participants returning a positive BAC reading. Details of three participants with a positive BAC are included as case studies below. The fourth cyclist tested returned a BAC of 3.00%, it is it is assumed that this is an error and this reading has been excluded from the analysis.

Positive BAC results: Case studies

To further understand the characteristics of the cyclists who returned a positive BAC result, the qualitative descriptive details of the three cyclists are included below. Participants were asked *'Do you think that drinking alcohol before riding a bicycle would negatively affect your riding skills'*.

One participant returned a BAC result of **0.02%**. The cyclist was male, aged 18-25 years, had a current driver's licence and 11-20 years riding experience. He agreed that alcohol would affect riding skills, but that it was acceptable to ride at a BAC under 0.05%.When intoxicated, he would usually get home by taxi. He also agreed that drugs would affect cycling skills. His crash occurred on an off-road path, on a Sunday between 5pm and midnight. He sustained moderate injuries.

One participant returned a BAC result of **0.08%**, over the legal limit to operate a vehicle. The cyclist was male, aged 26-40 years, did not have a driver's licence and had over 20 years riding experience. He agreed that alcohol would negatively affect riding skills but that it was acceptable to ride with a BAC between zero and 0.05%. When intoxicated, he would usually get home by taxi or public transport. Despite his crash circumstances, he said he would not travel home by bicycle when intoxicated. He agreed that drugs would negatively affect cycling skills. His crash occurred on a road with no bike lane, on a Saturday between midnight and 6am. He sustained minor injuries.

One participant returned a BAC result of **0.25%,** five times the legal limit to operate a vehicle. The cyclist was female, aged 41-60 years, had a driver's licence and 1-5 years riding experience. She agreed that alcohol would negatively affect riding skills but that it was acceptable to ride with a BAC between zero and 0.05%. When intoxicated, she would usually travel home by taxi or walk. Despite her crash circumstances, she said she would not travel home by bicycle when intoxicated. She agreed that drugs would negatively affect cycling skills. Her crash occurred on a road with no bike lane, on a Saturday between midnight and 6am. She sustained moderate injuries.

Drug use

No participant was tested for drug use and this was confirmed by the toxicology reports from the hospital that did not contain any record of drug tests or drug use among cyclists.

Attitudes to recreational drug use and cycling skills

The majority of cyclists believed that the use of recreational drugs would negatively affect their riding skills (91.5%). Responses varied about whether some drugs would affect riding skills more than others. Slightly more than half of participants (55.9%) believed some drugs would affect

cycling more than other drugs. Specific drugs mentioned included marijuana which was believed to negatively affect riders' reaction time and possibly impair balance, while cocaine, speed, ecstasy, hallucinogenic drugs, heroin, or 'anything the police would check for', were considered to have a negative impact on cycling skills. A considerable proportion (42.1%) didn't know as they had no personal experience of drug use while other participants declined (1.3%) or believed there was no difference (0.7%).

Discussion

This in-depth case study provided new insights into the prevalence of alcohol use and attitudes towards alcohol and drug use. However, given the small sample size, few comparisons were statistically significant. The greater value of this study is to identify hypotheses to be tested in a larger study cohort or through more specific analysis of police reported data of cyclists in crashes or hospital presentations and admissions data.

Testing for alcohol and drug use

The rate of testing across the study cohort was low for alcohol (14.6%) and no participants were tested for drug use. There was no clear pattern for why some participants were tested for alcohol compared to others. Age was significant; however, it is not clear why older participants were more likely to be tested. It is not possible to determine if the test was in response to indicators to the medical staff (e.g. slurred speech, smell of alcohol). The three participants with a positive BAC test result were from across three different age groups, suggesting that age is not necessarily a predictive factor when testing for alcohol use.

Single vehicle crash was the other variable with statistical significance. Participants in this crash type were more likely to be tested. Again, it is possible that these participants had indicators of alcohol use. Interestingly, injury outcome was not a trigger for blood alcohol testing. Internationally, testing for alcohol in people who present to emergency departments is much more routine. In Finland, presentations are breathalysed by emergency department staff (Airaksinen, Lüthje et al. 2010). However, timing of tests are also important, as in the US, delays in testing for alcohol can be as long as six hours, which is likely to lead to a lower BAC reading than if the test was conducted on arrival (Li, Baker et al. 1996).

Barriers to increased hospital testing for substance use amongst cyclists may be associated costs, priority of treatment or beliefs of some hospital staff that their role is not law enforcement or that taking samples is a waste of valuable clinical time (Ogden, Morris et al. 2010). Further, it is possible that routine testing for substance use in hospitals may be perceived by some members of the public as a disincentive to present to hospital which could lead to a delay in treatment. However, to accurately determine the prevalence of substance use in relation to cyclist crashes, it is essential that toxicology tests are conducted and reported for all cyclists. Lack of testing and underreporting of cyclists' alcohol and drug status have been identified in previous research as hampering understanding of the prevalence of these behaviours and the impact on cyclist safety (Li, Baker et al. 1996, Juhra, Wieskötter et al. 2012).

The finding of low testing rates highlights the gap in our understanding of the potential prevalence of substance use as a contributing factor in cyclist crashes. With regard to alcohol, intoxicated cyclists are sometimes considered more of a danger to themselves than to other road users (Juhra, Wieskötter et al. 2012). Yet when cyclists are drunk, their movements may be unpredictable and they may make risky choices, for example ride without lights at night, these behaviours can increase their crash risk and impact on the ability for drivers to safely share the road (Ryan 1967, Rowe, Rowe et al. 1995, Andersson and Bunketorp 2002, Kurzethaler, Wambacher et al. 2003). Accurate data on alcohol and drug use when cycling will provide a meaningful basis to determine if

widespread behaviour change programs are necessary, and if so, which substances and sections of the community should be targeted.

Attitudes – alcohol

Alcohol intoxication has clearly been identified as having a detrimental impact on cyclists' safety (Kraus, Fife et al. 1987, Olkkonen and Honkanen 1990, Li and Baker 1994, Li, Baker et al. 1995, Li, Baker et al. 1996, McCarthy and Gilbert 1996, Kurzethaler, Wambacher et al. 2003, Rosenkranz and Sheridan 2003, Cummings, Rivara et al. 2006, Crocker, Zad et al. 2010). Attitudes towards intoxication while cycling varied in this study, almost evenly divided between participants who considered a BAC of between zero and 0.05 acceptable.

Participants who reported a BAC of under 0.05 to be acceptable while cycling, appear to apply the same alcohol laws for drivers to cyclists. For these respondents, this legal limit is acceptable to drive a vehicle and ride a bike. Even participants who had recorded a positive BAC level agreed that alcohol would impede their ability to cycle, it is not known if these participants' attitudes were adopted after their crash event.

In Australia, drivers have been the focus of anti-alcohol and anti-drug road safety campaigns, to the neglect of other road users, including cyclists, motorcyclists and pedestrians. Greater understanding is needed of the role of substances in misadventure affecting these other road users. However, given the dangers of interacting on the road while intoxicated, it is likely that safety gains would be achieved by extending public behaviour change campaigns to all road user types, including pedestrians (Li and Baker 1994, Rosenkranz and Sheridan 2003). Alcohol use among pedestrians is particularly important, as the reported levels of intoxication for pedestrians involved in road crashes are reportedly substantially higher than for other road user groups (Rao, Zhao et al. 2013). Other factors that need to be considered across all road groups include safe use of mobile phone and audio devices that have negative impacts on awareness.

Attitudes – drugs

Research has identified drug use as a significant contributing factor in serious injuries to cyclists, increasing the likelihood by 375.4 percent (Ryan 1967). However, as none of the participants in this study were tested, we were unable to determine the extent of drug use in this cohort. Some participants in this cohort had limited experience with drugs and the potential effects of drug use on cycling.

Given the increasing acceptance of drug use in some sections of the community and the reported useage rates, particularly marijuana, there is an increasing likelihood that some people are travelling on our roads under the influence of some form of illicit drug. While statistics are increasing for the rate of drug use among drivers (Ogden, Morris et al. 2010), no data was found in this study related to cyclist use.

The co-use of alcohol and drugs was not explored in this study due to lack of data. However, this is an additional complexity that can further impede an individual's ability to safely interact on the roads. Reported co-use of alcohol and other drugs in Australia is very high with the majority of people who use marijuana (87.3%), cocaine (86.9%), ecstasy (85.4%) and meth/amphetamine (80.8%), drinking at the same time on at least one occasion (AIHW 2008). Again, it is important to understand the prevalence of this behaviour amongst all road user types, including cyclists, to first identify the extent of drug use as well as the type of drug, and then develop effective, targeted behaviour change programs to improve the safety of all road users.

Strengths and limitations

The strengths of this study are gained in the in-depth analysis of crash events. The interivews provided detailed information about the events of the crash and the injury outcome as well as attitudinal details about other issues, such as alcohol and drug use, that are typically not captured in traditional crash investigations. The interview data is a rich, comprehensive data source that can be further explored to better understand issues that impact cyclist safety.

Despite 158 in-depth crashed cyclist interviews, this is a relatively small sample size and this limits the types of data analysis that can be conducted. A larger study using this study design would provide greater insights that may allow statistically significant effect sizes to be calculated.

Conclusion

This study provided new insights into cycling and alcohol use, drug testing and attitudes about alcohol and drug use while cycling. Reported rates of alcohol and drug use amongst cyclists is low, both in the literature and in this study and only a small number of participants returned a positive BAC result. However, among those with a positive BAC, there may have been a disconnect between reported attitudes and actual behaviour. The majority of the study cohort agreed that alcohol would impede their cycling skills. Low rates of alcohol intoxication and the absence of positive drug use is likely to be a result of few people being tested. It is not known how prevalent these behaviours are amongst cyclists. It is recommended that more data be collected on alcohol and drug use amongst cyclists. To overcome the low testing rate barrier, there may be a role for researchers to initiate these types of tests in future studies. This would shift the burden from medical staff and relieve the cost on hospital resources. Finally, it is important that road safety campaigns that address substance use while interacting on the roads be targeted at all road users, including cyclists, motorcyclists and pedestrians.

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