Title: Investigating differences between drugs used in the Australian night-time economy: demographics, substance use and harm

Running Head: Drug use in the Australian night-time economy

Key words: Australia, night-time economy, ecstasy, methamphetamine, cocaine, cannabis

Glossary:

Night-time economy: a concept that refers to a range of leisure activities and lifestyle experiences associated with night-time socialising.

Ecstasy: a synthetic euphoric and empathogenic drug containing methylenedioxymethamphetamine (MDMA).

Cannabis: A depressant psychoactive drug prepared from the cannabis plant.

Methamphetamine: a synthetic stimulant drug and the most common form of amphetamine-type stimulant available in Australia.

Cocaine: A stimulant drug extracted from the leaves of the coca plant.

Polydrug use: the use of two or more psychoactive drugs concurrently.

Event-level studies: research undertaken in/during the event under investigation.
Abstract

Background: Understanding the characteristics of drug users in the night-time economy (NTE), and whether particular drugs are associated with risky practices and experience of harm, is necessary to inform targeted policy responses in this context.

Objectives: To investigate the correlates of drugs used in the Australian NTE relating to demographics, alcohol use, and experience of harm.

Methods: Patrons were interviewed in the NTE of five Australian cities in 2012-2013 (n=7028; 61.9% male, median age 22 years). A custom designed survey gathered demographic data, alcohol and substance use on the current night, and experience of harm in/around licensed venues in the past three months. Multivariate logistic regression analyses examined the correlates of drug use.

Results: Ecstasy was most commonly reported (4.0%), followed by cannabis (2.9%), methamphetamine (2.6%) and cocaine (1.6%). Ecstasy users were more likely to be younger and report energy drink consumption. Cannabis users were more likely to be male, and to have been involved in intoxication-related accidents/injuries and sexual aggression in/around licensed venues in the past three months. Methamphetamine users were more likely to have been interviewed later, and to have engaged in pre-drinking. Cocaine users were more likely to be male, aged 21 years or more, have a BAC of greater than 0.10%, and to have been involved in intoxication-related accidents/injuries in the past three months.

Conclusions/Importance: We identified significant differences between types of drug users and the harms they experience, underscoring the need to develop innovative harm reduction policies in the NTE rather than blanket population-based approaches.
Introduction

Risky consumption practices in the night-time economy (NTE) have been linked with violence, injury and impaired driving, placing a significant burden on emergency services personnel such as police, paramedics and hospital staff (Chikritzhs & Stockwell, 2002; Miller et al., 2014). Australian research indicates that violence and harm in the NTE peaks between the hours of 9pm and 3am and is most frequent on Friday and Saturday nights (Briscoe & Donnelly, 2001); as a consequence, a significant amount of research has been undertaken investigating ways of reducing alcohol consumption and intoxication in the NTE (Chikritzhs & Stockwell, 2002; Kypri, Jones, Mc Elduff, & Barker, 2011; Liang & Chikritzhs, 2011; Miller et al., 2014). Far less attention has been directed to understanding the patterns and correlates of drug use in the NTE and whether there is a need for policies or interventions to address drug use in this context. This is an important consideration given indicators of increased harms to stimulant users in Australia by way of ambulance presentations (Heilbronn et al., 2013) and deaths (Roxburgh & Burns, 2015).

In Australia, the most commonly reported illicit drugs used across the community are cannabis (35% report having ever used and 10% report consumption in the past 12 months), ecstasy (11% ever and 3% in the past 12 months), cocaine (8% ever and 2% in past 12 months) and methamphetamine (7% ever and 2% in the past 12 months). However, much higher estimates are reported by young adults aged 20-29, with 21% reporting cannabis use, 9% reporting ecstasy use and 6% reporting cocaine and methamphetamine use in the past 12 months (Australian Institute of Health and Welfare, 2014). In the context of the NTE, estimates from event-level research with patrons suggest that, on a given night out, illicit drugs are consumed by 6-10% of Australian NTE patrons (Miller, Curtis, et al., 2015; Miller, Droste, et al., 2015), and approximately 10% of European NTE patrons (Hughes et al., 2011). In previous Australian research, it has been estimated that alcohol is consumed by
approximately 90% of NTE patrons (Jenkinson, Jolley, & Dietze, 2014; Pennay et al., 2015), with one event level study reporting that patrons had consumed a median of eight drinks at the time of interview during their night out (Pennay et al., 2015), and surveys with young psychostimulant consumers reporting that they consumed a median of 15 drinks on their most recent night out (Jenkinson et al., 2014).

The most popular drugs used in the NTE are aptly named ‘party’ or ‘club’ drugs such as ecstasy, methamphetamine and cocaine, but also cannabis (Bolier, Voorham, Monshouwer, van Hasselt, & Bellis, 2011; Gripenberg-Abdon et al., 2012). Previous research has established that the combination of alcohol and illicit stimulants are popular in the NTE (Jenkinson et al., 2014; Pennay et al., 2015). Stimulants reportedly enable wakefulness, counteract the sedating effects of alcohol, and enhance alcohol-related intoxication and enjoyment of practices such as dancing (Maxwell, 2005; Pennay, 2012; Pennay et al., 2015).

Perhaps as a consequence, Australian research indicates that stimulant drugs are the most commonly used illicit substances in the NTE, reported by 4-9% of patrons on a given night (Miller, Curtis, et al., 2015; Miller, Droste, et al., 2015), but a European study reported higher rates of cannabis use (7% versus 4% for stimulant drugs) in this context (Hughes et al., 2011). It is less clear why cannabis is popular in the context of the NTE, particularly given it is less commonly identified as a preferred combination with alcohol (McKetin, Chalmers, Sunderland, & Bright, 2014; Pennay et al., 2015).

While we have developed a good understanding of the prevalence of illicit drugs in the NTE, less is known about the demographic characteristics of different drug users in the NTE, and whether there are particular drugs that are associated with risky practices and experience of harm in this context. Addressing this knowledge gap is critical given that there are distinct pharmacological and social properties associated with the most prevalent drugs used in the NTE. For example, cannabis and stimulant drugs have markedly different perceptual and
mood effects, and are used in different social contexts (Ashton, 2001; Maxwell, 2005; Measham & Moore, 2009). Even among stimulant drugs, distinct pharmacological and social properties are evident, with ecstasy often associated with empathy and closeness with others (Olsen, 2009) and methamphetamine associated with increased alertness and aggression (McKetin, Lubman, et al., 2014), while both are closely linked to dancing and sociability (Hunt, Evans, Moloney, & Bailey, 2009; Pennay, 2012).

Previous research has suggested that stimulant users (including energy drink consumers) consume more alcohol than those who have not consumed stimulants (Pennay et al., 2015). Given the well-established relationship between alcohol consumption and violence and injury (Buss, Abdu, & Walker, 1995; Ireland & Thommeny, 1993; Macdonald et al., 2005), it is important to investigate the role of illicit drug use in contributing to harm among NTE patrons, while controlling for consumption practices that are known to contribute to harm such as alcohol, but also energy drink use (Peacock, Pennay, Droste, Bruno, & Lubman, 2014) and demographic factors such as age and gender (Graham & Wells, 2001; Wells et al., 2014). A number of event-level studies have explored the correlates of violence or physical aggression among NTE patrons, including drug use (e.g. Miller, Droste, et al., 2015; Schnitzer et al., 2010). Miller et al. (2015) found that patrons who reported consuming illicit drugs on the current night out were 1.9 times more likely to report involvement in a violent incident in the past 12 months, while Schnizter et al. (2010) found that use of a range of drug types (analysed by frequency of recent use, not necessarily on the current night) were associated with involvement in violence in the past 12 months in bivariate analyses, but only less than monthly or at least monthly cocaine use among males remained a predictor of violence in multivariate analyses.

While these studies have explored the correlates of violence or physical aggression among patrons of the NTE, including drug use, to our knowledge no previous studies have explored
the correlates of drug use among patrons of the NTE using event-level data collection methods (i.e. collecting data from patrons during a session of alcohol and other drug use).

Further, given the aforementioned social and pharmacological differences between drugs commonly used in the NTE, it is important to understand who is using different drugs in this context and which drugs are associated with risky consumption practices and experience of harm. Such information is necessary to inform effective, targeted responses to drug-related harm in this context.

Material and Methods

Setting

Patrons were interviewed in the NTE of five Australian cities, three of the largest cities in Australia: Sydney (approximately 4.3 million residents), Melbourne (4.1 million residents) and Perth (1.8 million residents), and two smaller regional towns: Wollongong (235,000 residents) and Geelong (180,000 residents). These cities were chosen because they have vibrant NTEs, with late trading hours (as late as 7am and in some cases 24 hour trading). The legal drinking age in Australia is 18 years and the legal blood alcohol concentration (BAC) limit for driving is 0.05%.

Procedure

In each city, teams of six to 12 researchers interviewed patrons of the NTE. Each team was accompanied by a team leader who oversaw the geographical positioning of the team and safety precautions. Data collection was undertaken on Friday and Saturday nights in four hour shifts between 8pm and 5am from December 2011 to June 2012 (data were collected on at least 10, and up to 15, individual nights in each city). Teams of researchers congregated in the main entertainment precincts of each city. In the regional cities, researchers frequented
the busiest areas of the city on each night of data collection. In the bigger cities, areas which
generally attracted a large number of patrons were visited on rotation.

Researchers approached every third patron walking between venues, leaving venues, or
queuing to enter venues, and invited them to participate in a short survey about nightlife.
Participants were offered business cards detailing the aims of the study, contact details for
investigators and ethics information. Following verbal consent, data were collected using Tap
Forms© software on Apple iPod Touch or iPhone devices. Interviews were anonymous.
Exclusion criteria included being less than 18 years old and being too intoxicated to
participate (from alcohol or illicit drugs; judged by the researchers based on visible signs of
intoxication and/or feeling unsafe [n=9, with a further n=3 interviews terminated mid-way]).
Researchers received extensive safety training prior to data collection, including how to deal
with patrons who were heavily intoxicated from alcohol or drugs.

At the conclusion of the interview, participants were asked if they were willing to provide a
breath sample to measure their BAC (to which 93.3% of the sample agreed). Participants
were permitted to know their BAC reading, but researchers were ethically obliged to inform
participants that this reading was only indicative and should not be used as evidence of ability
to legally drive.

The study was approved by the Human Research Ethics Committees of all participating
universities (Deakin University, Eastern Health, Alfred Health, Curtin University, University
of Western Sydney, and University of Wollongong). See Miller et al. (2013) for full study
protocol.

*Measures*
A custom designed survey gathered basic demographic data including gender and age, and questions about substance use including engagement in pre-drinking (‘Did you drink alcohol before going to licensed venues tonight?’ [yes/no]), consumption of energy drinks (‘Have you consumed any energy drinks tonight?’ [yes/no]), and drug use (‘Have you had any other drugs tonight, illicit or others?’ [yes/no]. If yes, ‘Which other drugs have you had tonight?’). With respect to timeframes, participants were prompted to discuss the ‘current session’ but where these were reported to be significantly long, participants were instructed to only report drug use that had occurred within the past 12 hours. BAC was measured using Andatech Alcosense Prodigy units. Participants were also asked about experience of certain forms of harm in the last three months, including involvement in aggression (‘Have you been involved in any incidents of aggression in or around licensed venues in the past three months?’ If yes, ‘Physical, verbal or sexual?’ – multiple options permitted) and injury (‘Have you been involved in any intoxication-related injuries or accidents in the past three months?’).

Two important points should be considered in relation to the aggression and injury questions. Firstly, it should be noted that the aggression items do not distinguish whether the interviewee was the perpetrator or the victim due to the complex interpretation of such questioning. This decision was based on the authors’ experience that dichotomising incidents of aggression into ‘victim’ and ‘perpetrator’ relies on subjective interpretation of the incident which is fraught for many reasons; for example: a) both parties may think the other person is the perpetrator (for example, one individual may accidentally bump another but the second individual believes it was purposeful and initiates conflict – in this case both may believe the other is the perpetrator and both subsequently engage in the behaviour); b) one individual may initiate a verbal confrontation and the second individual may respond with physical aggression resulting in both claiming victim status; and c) many incidents involve more than two people who engage in conflict and the ‘victim’ is the loser regardless of who initiated the
conflict. As such, we recorded involvement to ensure that subjective interpretation of incidents did not undermine prevalence estimates.

Secondly, the current study examined associations between measures of behaviour on the night of the interview with incidents that have occurred in the past three months. This is because the prevalence of reported incidents of aggression and injury on a given night are likely to be low, both because we interviewed people during and not at the end of the night, and also because if the incident was significant enough to warrant police, ambulance or hospital attention these people are unlikely to be back on the street after the incident and available to be interviewed. While our analysis cannot provide a direct association between drug use and aggression or injury on a specific night, what this approach allows us to do is draw an association between drug use and experience of aggression and injury in the past. This approach assumes that past behaviour is representative of typical behaviour for respondents and while this is not a perfect assumption, this approach is often used in studies of this kind (see for example, Miller, Droste, et al., 2015; Schnitzer et al., 2010) due to the problems with capturing aggression and injury on the current night.

Analysis

Data were exported into Stata Version 12 for analysis (StataCorp, 2015). Drug use was dichotomised into a yes/no variable; ‘yes’ indicated anyone who had reported illicit drug use (including non-prescribed use of pharmaceutical drugs) that night. Descriptive statistics were computed to assess the rate of drug use among the sample and characteristics of drug users, with Chi-Square tests as a measure of significance. Separate multivariate logistic regression analyses were then performed to assess the correlates of use of the four most commonly reported drugs: ecstasy, cannabis, methamphetamine (which is the most common form of amphetamine-type stimulant available in Australia and includes powder [“speed”] and crystal
[“ice”] forms; Pennay & Lee, 2008) and cocaine. For the purpose of these analyses, drug use was dichotomised into a yes/no variable; ‘yes’ indicated anyone who had reported use of that particular drug and no included anyone who had not reported use of that drug (although may have reported use of other drugs). A fifth multivariate logistic regression analysis was performed which assessed the correlates of polydrug use. Polydrug use is defined as self-reported consumption of more than one illicit drug on the current night out. For the purpose of analysis, location of interviews was dichotomised into capital city (Sydney, Melbourne and Perth) and regional city (Wollongong and Geelong). In all analyses, $p$-values $< 0.05$ were interpreted as statistically significant.

**Results**

*Sample characteristics and prevalence of substance use*

Of the 7,581 individuals approached to participate in the study, 7,028 agreed to be interviewed (92.7% response rate). A small number of participants (n=44, <1%) refused to answer interview questions about substance use and these participants were removed from further analyses, leaving a total sample of 6,984. More than half (n=4322, 61.9%) of the sample was male, with a median age of 22 years (range 18–73); more than two thirds of participants were interviewed in capital cities (n=5010, 71.3%). Majority of the sample reported consuming alcohol on the current night (88.5%), and at the time of interview, participants reported having consumed a median of seven standard alcoholic drinks (10 grams of ethanol per standard drink in Australia), recording a median BAC of 0.054%.

Approximately two thirds of patrons reported pre-drinking (n=4396, 64.6%), and at the time of interview just over one-fifth of participants reported energy drink consumption on the current night out (n=1536, 22.6%). At the time of interview, one in ten (n=702, 10.1%) participants self-reported using substances other than alcohol and tobacco (i.e., illicit drugs or
non-prescribed pharmaceutical drugs) during the current night out, with 92.0% of drug users also reporting alcohol use on the current night.

At the time of interview, ecstasy was the most common drug reportedly used by the sample on the current night out (n=277, 4.0%), followed by cannabis (n=203, 2.9%), methamphetamine (n=184, 2.6%) and cocaine (n=110, 1.6%). Drugs less frequently reported included pharmaceutical stimulants (n=30, 0.4%), LSD (n=16, 0.2%), GHB (n=10, 0.1%), opiates (n=10, 0.1%), benzodiazepines (n=9, 0.1%), mephedrone (n=6, 0.09%), ketamine (n=5, 0.07%), and other (such as mushrooms and pharmaceutical opiates; n=32, 0.5%). One hundred and forty participants reported polydrug use (2.0%). The most popular polydrug combinations included ecstasy and methamphetamine (n=56, 0.7%), methamphetamine and cannabis (n=33, 0.5%), and ecstasy with either cocaine (n=27, 0.4%) or cannabis (n=27, 0.4%).

Involvement in incidents of physical (n=751, 10.7%) and verbal (n=652, 9.3%) aggression in/around the NTE in the past three months were experienced by approximately one-tenth of participants, with only 1.8% (n=127) of participants reporting involvement in experience of sexual aggression in the NTE in the past three months. Approximately one sixth of participants (n=907, 14.1%) were involved in intoxication-related accidents or injuries in or around licensed venues in the past three months.

**Correlates of substance use**

Table 1 shows the characteristics of study participants aggregated according to whether they reported use of any illicit drug. Those who reported illicit drug use on the current night out were significantly more likely to be male, to have been interviewed later in the evening, to have a significantly higher BAC reading at the time of interview, to report pre-drinking and
energy drink use so far on the current night out, and to report involvement in all types of aggression in/around licensed venues and intoxication-related injury in the past three months.

Table 2 shows the results of the multivariate logistic regression analyses assessing the correlates of ecstasy, cannabis, methamphetamine, cocaine, and polydrug use. Significant correlates varied by drug type. Ecstasy users were more likely than non-ecstasy users to be younger (OR=0.36, CI=0.25-0.60) and report energy drink consumption so far on the current night out (OR=1.81, CI=1.31-2.50). Cannabis users were more likely than non-cannabis users to be male (OR=2.18, CI=1.44-3.31), to have been interviewed in a capital city (OR=1.81, CI=1.26-2.60), to report pre-drinking on the current night (OR=1.53, CI=1.01-2.34), and to report having been involved in intoxication-related accidents/injuries (OR=1.77, CI=1.17-2.67) and sexual aggression in/around licensed venues in the past three months (OR=3.01, CI=1.33-6.97). On the other hand, cannabis users were more likely to have a lower BAC than non-cannabis users (OR=0.60, CI=0.39-0.91).

Methamphetamine users were more likely than non-methamphetamine users to have been interviewed later in the evening (OR=2.49, CI=1.32-4.70) and to have engaged in pre-drinking on the current night (OR=2.08, CI=1.27-3.43), but as with cannabis users, were also more likely to have a lower BAC (OR=0.64, CI=0.42-0.99). Cocaine users were more likely than non-cocaine users to be male (OR=1.90, 1.07-3.38), to be older (OR=5.04, CI=2.50-10.15), to have been interviewed in a capital city (OR=2.12, CI=1.28-3.50), to have a BAC of greater than 0.10% (OR=1.79, CI=1.00-3.17) and to have been involved in intoxication-related accidents/injuries in or around licensed venues in the past three months (OR=2.02, CI=1.19-3.42). Finally, polydrug users were more likely than non-polydrug users to be male (OR=1.84, CI=1.21-2.78), to have been interviewed later (OR=4.48, CI=2.11-9.49), to have engaged in pre-drinking (OR=1.62, CI=1.03-2.56), to have consumed energy drinks (OR=1.53, CI=1.06-2.23) so far on the current night, and to have been involved in physical
aggression in/around licensed venues (OR=2.01, CI=1.23-3.23) and intoxication-related accidents or injuries in the past three months (OR-1.91, CI=1.25-2.90).

**Discussion**

These findings suggest that the drugs most commonly used in the Australian NTE are ecstasy, cannabis, methamphetamine and cocaine. These are also the four most frequently reported illicit drugs used in the last 12 months by Australians (Australian Institute of Health and Welfare, 2014). Initial analyses indicated drug users were more likely to be male, interviewed at a later stage in the night, report engagement in a range of risky consumption practices on the current night and were more likely to report involvement in aggressive incidents and experience of injuries in or around licensed venues in the past three months. This is consistent with previous Australian findings from Miller et al. (2015). However, analysis by individual drug type showed that the demographic profile of drug users in the Australian NTE are distinctly different, as are the consumption practices and the harms associated with each drug (see also Ramo, Grov, Delucchi, Kelly, & Parsons, 2010).

*Demographic correlates of NTE drug use*

The common finding across drug types was that males were significantly more likely to report using cannabis, cocaine, and engage in polydrug use, although this finding was not evident for ecstasy and methamphetamine. With regards to age, however, there was less of a consistent trend. Ecstasy users were more likely to be aged 18-20 years, and cocaine users were five times more likely to be aged over 26 years, as compared with 18-20 years. Findings from a study of ‘ecstasy and related drug users’ in Australia (Sindicich & Burns, 2015) reported that the median onset age of ecstasy use among participants was 18 years, and cocaine use was 21 years, which parallels these findings (see also Australian Institute of Health and Welfare, 2014). Cocaine is also more expensive than ecstasy in Australia.
(Sindicich & Burns, 2015), which may explain why it is less commonly used among 18-20 year olds, who may have less disposable income.

Cannabis and cocaine users were more likely to be interviewed in capital cities than regional cities, with no geographical trends evident for ecstasy, methamphetamine and polydrug use. Population data indicates that stimulant drugs (ecstasy, methamphetamine and cocaine) are more commonly used by participants living in capital cities than regional cities, but that cannabis is used by more regional participants (Australian Institute of Health and Welfare, 2014). These findings are only partially supported by the current study, suggesting more research is needed with respect to use of these drugs in metropolitan and regional night-time economies, particularly given the burden that alcohol and drug-related harms have on emergency services in regional areas (Miller, Coomber, Staiger, Zinkiewicz, & Toumbourou, 2010).

Methamphetamine users were 2.5 times, and polydrug users were 5 times, more likely to be interviewed after 1am, as compared with before 11pm. This is consistent with a strong body of literature showing that stimulant drugs are used for wakefulness and to facilitate a ‘big night out’ (Measham & Moore, 2009; Peacock, Bruno, & Martin, 2013; Pennay et al., 2015). As such, it is surprising that cocaine and ecstasy were not associated with a later interview time. This might be explained by the longer stimulant effect of methamphetamine and shorter half-life of ecstasy and cocaine (Cunha-Oliveira, Rego, Carvalho, & Oliveira, 2013; Fallon et al., 1999). Alternately, consumers of ecstasy and cocaine may move away from licensed venues at later stages of the night, choosing to attend private domestic parties or continue their session of alcohol and drug use at home. This may be motivated by financial pressures, or a desire to continue illicit substance use in more private contexts (see Hunt et al., 2009; Pennay, 2012).
Alcohol consumption among NTE drug users

Concurrent use of alcohol with ecstasy, cannabis, methamphetamine and cocaine has been commonly reported (Boys, Lenton, & Norcross, 1997; Earleywine & Newcomb, 1997; Grov, Kelly, & Parsons, 2009; Jenkinson et al., 2014; Measham & Moore, 2009); however, in this study cannabis users were more likely to have a lower BAC than non-cannabis users. It appears that while cannabis use and alcohol are commonly combined in the Australian NTE, it is generally in the context of more moderate alcohol consumption. This is has been identified in previous Australian research (McKetin, Chalmers, et al., 2014; Pennay et al., 2015), and may be explained by the fact that both drugs have sedative effects, which may be exacerbated when combined, and therefore might not be conducive to dancing and socialising (McKetin, Chalmers, et al., 2014).

Alternately, cocaine use was associated with 1.7 times the likelihood of having a BAC greater than 0.01%, which is supported by prior research suggesting that use of the two substances in combination results in a more pleasurable alcohol intoxication and reduced experience of alcohol-related inebriation (Pennay, 2012; Pennings, Leccese, & de Wolff, 2002). These findings have important implications for emergency services, particularly in relation to driving under the influence. Further research should explore whether NTE patrons who combine alcohol and cocaine are more or less likely to drive home from entertainment precincts than consumers who have consumed the same amount of alcohol without cocaine.

Given the established popularity of concurrent alcohol and methamphetamine use (Pennay, 2012; Pennay et al., 2015), it is surprising the association only held for cocaine use and that methamphetamine was associated with lower BAC. This may be partially explained by experimental research which shows that the co-consumption of alcohol and methamphetamine decreases BAC, relative to alcohol-alone (Mendelson, Jones, Upton, &
However, methamphetamine was associated with twice the likelihood of engagement in pre-drinking, which is also supported by previous work (Miller, Droste, et al., 2015; Pennay, 2012; Pennay et al., 2015) showing that methamphetamine is often used to enhance the effects of alcohol and in some cases enable patrons to ‘straighten up’ and feel less inebriated (Pennay, 2012). Aside from polydrug use, the only drug associated with energy drink consumption was ecstasy. This is also not surprising given the popularity of energy drinks reported by ecstasy consumers (Peacock et al., 2015), and that lollipops and other sweet drinks have long been a feature of raves and commonly used with ecstasy (Hitzler, 2002; Malbon, 1999; Redhead, 1993). To our knowledge there has not been any research on the health implications of combining illicit and licit stimulants in the form of ecstasy and energy drinks, and future research in this area is warranted.

**Experience of harm among NTE drug users**

Finally, there were differences between drug users in terms of self-reported experience of harm in the past three months. Polydrug use was associated with two times the likelihood of involvement in physical aggression, and a trend that approached significance ($p<0.054$) was that patrons who reported methamphetamine use on the current night were 1.6 times more likely than non-methamphetamine users to report involvement in physical aggression in/around licensed venues in the past three months – an association that is widely supported by research identifying a link between methamphetamine and aggression (e.g. McKetin, Lubman, et al., 2014; Tyner & Fremouw, 2008). Cannabis use on the current night was associated with a three-fold increased likelihood of involvement in sexual aggression in/around licensed venues in the past three months, an association far less intuitive, particularly given evidence that cannabis use is associated with reduced aggression (Hoaken & Stewart, 2003). It is not clear whether patrons who answered yes to this question were the aggressors or the victims. It may be that the sedative effects of cannabis (Green, Kavanagh,
Young, 2009) predisposed cannabis users more so to be victims of sexual aggression than non-cannabis users. More research is required to investigate these findings. Lastly, cannabis, cocaine and polydrug users were more likely to have been involved in intoxication-related injuries or accidents. Similarly, this might be explained by the sedative effects of cannabis, and potentially the inebriating effects of pre-drinking and heavy alcohol consumption that was common among cocaine and polydrug consumers.

Given that some groups of drug users interviewed in the NTE reported higher levels of involvement in aggressive incidents and experience of harm in this context, particularly polydrug users, these populations should be the target of future of harm reduction efforts in the NTE. However, to date, there has been limited research exploring what types of programs might be effective in reducing harm among drug users in the NTE. One study that involved training of licensed venue door staff to identify signs of patron drug use at entry with a view to denying drug users entry once identified, found that despite this training, the majority of door staff did not refuse entry to drug-intoxicated actors (Gripenberg, Wallin, & Andreasson, 2007). It is unlikely that licensed venues as profit-driven businesses would be willing to refuse entry to patrons on the basis of drug use, and it is also not clear that refusing entry to drug users – potentially leaving them on the street while their friends are inside – is the best approach to take in the NTE if the goal is harm reduction.

A second study testing exposure to health information among patrons of the NTE found no health promoting effects (nor counterproductive effects) of this information on attitudes and intention to use ecstasy among participants, however, exposure to GHB materials resulted in a more negative attitude towards GHB use (Whittingham et al., 2009). Other research has pointed out that drug education messages are often discredited by the users of these drugs as they do not correlate with their own experiences (Moore, 2010). What is needed are new innovative and thoughtful harm reduction approaches to reducing the problems associated
with illicit drug use in the NTE, and it is even more important that any future approaches consider the different demographics, alcohol use practices and harms experienced by different groups of drug users. For example, given that ecstasy use was not associated with experience of intoxication or harm, our suggestion is that any available national funding towards harm reduction relating to drug use in the NTE would be more appropriately allocated to exploring ways of reducing the association between alcohol intoxication and cocaine use; as well as the association between cannabis and cocaine use with accidents and injury, and cannabis with sexual aggression. For example, cannabis users might be targeted in a particular education campaign that focuses on the sedative effects of the drug and its potential relationship with involvement in unwanted or regretted sexual behaviour; furthermore cocaine and methamphetamine users might be educated about the association between alcohol intoxication and stimulant use and that while combining the two substances might make one feel less inebriated, the intoxicating effects of alcohol are still associated with the same level of impairment (e.g. Hernández-López et al., 2002; McCance-Katz, Kosten, & Jatlow, 1998; Mendelson et al., 1995). Such messages might be perceived as more credible by NTE patrons if they resonate with their experiences.

It is important to consider that while the analyses conducted here explored the relationship between reporting of drug use in the NTE and experience of recent harm in this context, experience of injuries, accidents and aggression in the NTE, among other things, are likely to be heavily influenced by social context, and the interactions between individuals and environments (Rhodes, 2009). As suggested by Rhodes, drug harms are shaped by the social situations and environments in which individuals participate, which is particularly pertinent when considering the nature of the NTE. Prior research suggests that there are a range of culturally, spatially and pharmacologically distinct polydrug repertoires and local leisure scenes in the NTE that are likely to influence risk-taking and harm (Hunt et al., 2009;
Measham & Moore, 2009), and future research should be undertaken to explore the dynamic relationship between particular drugs used in the NTE and the social and physical contexts in which they are used.

**Limitations**

It is important to consider that patrons were interviewed during a night out and participants may have commenced and/or continued to consume alcohol and illicit drugs after the interview. It may also be the case that participants were sold a drug they believed to be one substance but may have been another (e.g. ‘ecstasy’ containing methamphetamine instead of MDMA). As aforementioned, analyses with respect to drug use and harm draw on two different time frames and it is also important to note that it is not possible to identify whether participants were the perpetrators or the victims. Future studies should endeavour to collect more detailed information on experiences of aggression, such as whether the person perceived themselves as the instigator or victim and their relationship to the other party. This will enable better characterisation of the nature of incidents of aggression (i.e., as random, opportunistic, domestic, etc.), and inform whether different types of aggression are linked with specific substances.

Due to the brief nature of the questionnaire we were unable to explore severity of harms experienced and other important harms such as overdose, mental health issues, criminal justice problems and other social issues. Finally, given the personal and illegal nature of the subject matter, the context of data collection (on the street) and that participants may have been affected by alcohol and/or other drugs, it may be that drug use was under-reported (see, for example, Miller, Curtis, et al., 2015), although it should be noted that existing research shows good concordance between self-reported drug use and independent measures of drug use such as biomarkers (Basurto et al., 2009; Darke, 1998). Strengths of the study include
increased reliability of recall given the event-level nature of data collection and the novel detection of differences between types of drug users.

**Conclusions**

To our knowledge, this is the first study to have explored the correlates of drug use in the Australian NTE using event-level data. We identified significant differences between types of drug users, underscoring the need for future research to distinguish between drugs when attempting to understand demographics, consumption patterns and experience of harms among drug users in the NTE. Given the association between methamphetamine and pre-drinking, and cocaine and higher BAC, and previous evidence suggesting there is an increased risk to consumers who combine alcohol and stimulants (McCance-Katz et al., 1998; Mendelson et al., 1995), health promotion addressing the dangers of combining these substances, particularly in the context of the NTE, is warranted. Furthermore, given the differences between drug types with respect to associations with aggression and harm, it is important for harm reduction strategists to be targeted in their response to drug-related harm as observed in the NTE. This might require innovative strategies aimed at particular groups of drug users rather than blanket population-based approaches.
References


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