Available online at www.sciencedirect.com
ScienceDirect
Drug and Alcohol Dependence 84 (2006) 223–230
DRUG and ALCOHOL DEPENDENCE
www.elsevier.com/locate/drugalcdep

When is a little knowledge dangerous? Circumstances of recent heroin overdose and links to knowledge of overdose risk factors

Paul Dietze [a,b,*], Damien Jolley [b], Craig L. Fry [a,c], Gabriele Bammer [d], David Moore [e]

[a] *Turning Point Alcohol and Drug Centre, 54-62 Gertrude St Fitzroy, Vic. 3065, Australia*
[b] *Monash Institute of Health Services Research, Clayton, Vic., Australia*
[c] *Department of Public Health, University of Melbourne, Parkville, Vic., Australia*
[d] *National Centre for Epidemiology & Population Health, Australian National University, ACT, Australia*
[e] *National Drug Research Institute, Curtin University of Technology, WA, USA*

Received 1 September 2005; received in revised form 6 February 2006; accepted 6 February 2006

Abstract

Objectives: To describe the circumstances surrounding recent heroin overdose among a sample of heroin overdose survivors and the links to their knowledge of overdose risk.
Methods: A cross-sectional survey of 257 recent non-fatal heroin overdose survivors was undertaken to examine self-reported knowledge of overdose risk reduction strategies, behaviour in the 12 h prior to overdose and attributions of overdose causation.
Results: Most of the overdoses occurred in public spaces as a result of heroin use within 5 min of purchasing the drug. A substantial number of overdoses occurred with no one else present and/or involved the concomitant use of other drugs. While knowledge of at least one overdose prevention strategy was reported by 90% of the sample, less then half of the sample knew any single strategy. Furthermore knowledge of the dangers of mixing benzodiazepines and/or alcohol with heroin was associated with an increased likelihood of such mixing being reported prior to overdose.
Conclusions: While heroin users can articulate knowledge of key overdose risk reduction strategies, this knowledge was not generally associated with a reduction in risk behaviours but was in some cases associated with increased reports of overdose risk behaviours. Further research is required in order to better understand this paradoxical effect, focussing on risk reduction education amenable to the social contexts in which heroin use takes place.

Keywords: Heroin use; Heroin overdose; Behaviour change; Risk

1. Introduction

Heroin overdose is a serious public health issue (Darke et al., 1996b). The risk factors for heroin overdose are well-known and include the demographics of heroin users, the concomitant use of other drugs, changes in tolerance, the amount of heroin used and injection as the route of administration (Darke and Hall, 2003; Dietze et al., 2005). This information suggests that there is potential for effective intervention and a variety of initiatives have been developed to prevent heroin overdose.

Some of the most common heroin overdose prevention initiatives have been described in a recent review and these range from modifying the heroin-using environment, such as supervised injecting facilities, to increasing the availability of maintenance pharmacotherapy treatment, as well as resuscitation using naloxone (Darke and Hall, 2003). One key and very common intervention is the dissemination of educative messages about overdose risk (Darke and Hall, 2003; Dietze et al., 2001a; McGregor et al., 2001). These target behaviour change linked to the risk factors for overdose by encouraging heroin users to: avoid concurrent use of CNS depressant drugs, monitor their tolerance,

* Corresponding author. Tel.: +613 8413 8413; fax: +613 9416 3420.
E-mail address: pauld@turningpoint.org.au (P. Dietze).

0376-8716/$ – see front matter © 2006 Elsevier Ireland Ltd. All rights reserved.
doi:10.1016/j.drugalcdep.2006.02.005

avoid using alone and sample their heroin for strength prior to using the desired amount (McGregor et al., 2001; Moore, 2004). Additional messages target responses to overdose by encouraging people to contact emergency health services or provide basic resuscitation (Darke and Hall, 2003).

There is growing evidence about the effectiveness of various intervention strategies including maintenance pharmacotherapy treatment (Darke and Hall, 2003), bystander resuscitation (Dietze et al., 2002a), supervised injecting facilities (MSIC Evaluation Committee, 2003) and the provision of naloxone for peer administration (Chicago Recovery Alliance, 2002). However, the effectiveness of education programs designed to increase knowledge about overdose risk has not yet been demonstrated.

Such education programs have been widely undertaken as a component of many harm reduction activities for heroin users (Moore, 2004). These programs are typically based on a social marketing approach with targeted campaigns oriented towards heroin users at the time when they come into contact with service providers. While the effectiveness of these programs in producing behaviour change has not been demonstrated (Darke and Hall, 2003), they have been shown to increase knowledge about overdose risk factors, as well as appropriate responses to overdose such as resuscitation techniques (McGregor et al., 2001).

In a recent critique of overdose prevention, Moore (2004) cites some of the social and contextual factors that militate against the effectiveness of heroin overdose prevention education. In particular, he argues that features of the drug use and social environments of heroin users and the desire for heavy intoxication and withdrawal avoidance work to undermine expectations of 'rationality' (i.e. choice of health promoting behaviour in preference over harmful behaviour) that underpin typical messages. This tension between individualistic (e.g. health belief models) and social models (e.g. situated rationality) of risk perception, knowledge and behaviour has been debated more generally in the health field (Bloor, 1995), with some arguing that a major strategic weakness is the lack of understanding of the interconnection between attitudes, knowledge and risk behaviour (Williams et al., 1995).

It is beyond the scope of this paper to engage fully with this debate, however, evidence suggests that a range of factors in addition to risk knowledge influence risk behaviour choices. Review studies show that knowledge about health risks does not necessarily produce corresponding reductions in risk behaviours, particularly in relation to blood-borne virus transmission (Aloisi et al., 1995; Ferron et al., 1993; Gibson et al., 1993; Tapia-Aguirre et al., 2004). With overdose risk it is possible therefore that overdose prevention approaches based on education about putative risk behaviours may alone have limited effectiveness for heroin users who have different priorities to the avoidance of overdose. For example, assumptions that individuals will choose health-promoting behaviour may be unrealistic in the context of ambivalent attitudes towards death (Bennett and Higgins, 1999; Miller, 2002). Further, where purchase and injection of heroin in public settings is the norm, the desire to avoid detection by police or other users may preclude careful drug preparation or injection (Aitken et al., 2002). Finally, known risk behaviours may even be valued for the user-defined benefits they produce (Bloor, 1995). In this way the applied value of 'situated rationality' concepts of risk behaviour which include social context as an influencing factor on behavioural choices is that they introduce the possibility of 'functional risk', where understandings of overdose prevention messages may actually lead to increases in risk behaviours. For example, some heroin users may interpret messages to mean that intoxication effects can be increased by using other CNS depressant drugs or some users may have an inflated (and inaccurate) evaluation of their own drug using competence.

This paper has two aims. First, we examine the extent or market penetration of overdose prevention messages in Melbourne. Second, we seek to examine whether knowledge of overdose risk reduction strategies is associated with a reduction in risk behaviours, as would be expected on the basis of a simple educational approach to heroin overdose prevention. As such, our study provides an indirect evaluation of the effectiveness of the overdose risk reduction education strategies described above. These aims are explored in the context of the circumstances of overdose in terms of known risk factors among a sample of recent heroin overdose survivors. This aspect is important as much research on heroin overdose is plagued by definitional difficulties and pays little regard to overdose recency.

2. Methods

We conducted a cross-sectional survey of recent non-fatal heroin overdose survivors recruited through their contact with the Melbourne Metropolitan Ambulance Service. Melbourne is the capital of the Australian state of Victoria.

2.1. Participants

The details of our recruitment and case selection procedures have been described elsewhere (Dietze et al., 2002b, 2005; Heale et al., 2003). To summarise, 257 non-fatal heroin overdose survivors were recruited by ambulance paramedics from five ambulance branches in Melbourne between 7/1999 and 5/2001. Paramedics gave a total of 2031 numbered contact cards to eligible participants after resuscitation with naloxone following a heroin overdose, allowing a restricted, yet unambiguous, biological definition of overdose (regaining consciousness following naloxone administration). However, as detailed in our previous work (Dietze et al., 2005), we were unable to estimate the response rate as we were unable to track cards effectively and paramedics did not reliably record card numbers on Patient Care Records. Nevertheless, the available demographic characteristics of our sample were similar to those found for heroin overdose cases in Melbourne more widely (Dietze et al., 2005) suggesting that our findings may be expected among other overdose cases.

2.2. Procedure

Participants presenting within 10 days of their overdose (in order to maximise recall) were interviewed at Turning Point Alcohol and Drug Centre. The 50 min interview involved administration of a structured questionnaire by trained interviewers that canvassed: demographics, drug use and overdose history, the circumstances and characteristics (other drug use, location, etc.) of the 12 h prior to the heroin injection that resulted in overdose, personal attributions of overdose causation and knowledge of key overdose prevention messages. We used free recall prompting to measure knowledge of overdose prevention messages; participants were asked: "In your own words please describe your understanding of

how to avoid heroin overdose". After an initial response participants were asked if there was "anything else" until unable to provide further information. This strategy is consistent with accepted techniques, such as the Cognitive Interview (Fisher et al., 1989; Memon et al., 1997), for minimising the effects of leading interview questions. Responses were coded according to the messages commonly disseminated to heroin users, namely 'taste first', 'monitor tolerance', 'use with someone else' and 'don't mix drugs'. Participants were reimbursed AUD20.

2.3. Statistical analysis

The circumstances of the overdose event were examined including the prevalence of the risk factors identified in our previous case-crossover analysis of the current dataset (for transient risk behaviours such as benzodiazepine use, the prevalence of the behaviour in the 12 h prior to overdose was specified). Associations between participants' characteristics, their overdose history and their engagement in overdose risk behaviours were examined using binary logistic regression for dichotomous variables (e.g. benzodiazepine use in the 12 h prior to overdose, yes/no) or ordered logistic regression for ordinal categorical variables (e.g. amount of heroin used). We used logistic regression to estimate associations between knowledge of, and engagement in, overdose risk behaviours and overdose attributions after adjustment for demographic and overdose history variables. All analyses were undertaken using Stata SE V8.0.

3. Results

3.1. Sample characteristics

Fig. 1 shows the characteristics of the sample and their experience of overdose.

3.2. Experience of overdose

The large majority (75%) had experienced an additional overdose, half in the 6 months prior to interview (Fig. 1). Most of these overdoses resulted in the administration of naloxone. The experience of overdose was unrelated to any of the participant characteristics listed in Fig. 1 with the exception of incarceration and age. Participants who reported ever being incarcerated were around three times as likely to report ever having experienced an overdose (OR = 2.89, 95% CI = 1.50–5.59) and around two times as likely to report experiencing an overdose in the previous 6 months (OR = 1.96, 95% CI = 1.13–3.91) than those who did not report incarceration. A similar pattern was evident for naloxone administration (OR = 3.31, 95% CI = 1.83–5.99 and OR = 2.59, 95% CI = 1.46–4.62 for ever and previous 6 months, respectively). Older participants (>30) were more likely to report ever having experienced an overdose (OR = 2.99, 95% CI = 1.21–7.37) and naloxone administration (OR = 2.84, 95% CI = 1.27–6.33), but not in the previous 6 months, independently of any of the remaining participant characteristics (including years of injecting).

3.3. Engagement in overdose risk behaviours

Fig. 2 shows that around one-fifth of the sample engaged in one or more overdose risk behaviours prior to the overdose event. However, participant characteristics did not consistently predict this engagement. The only significant effects noted were for employment status and having ever experienced an overdose. Unemployed participants were 3.5 times as likely to report benzodiazepine use in the 12 h prior to overdose (OR = 3.53, 95% CI = 1.52–8.18), and those who reported never having experienced a prior overdose were 2.7 times as likely to report no alcohol use in the 12 h prior to overdose (OR = 2.72, 95% CI = 1.28–5.81), after controlling for confounders.

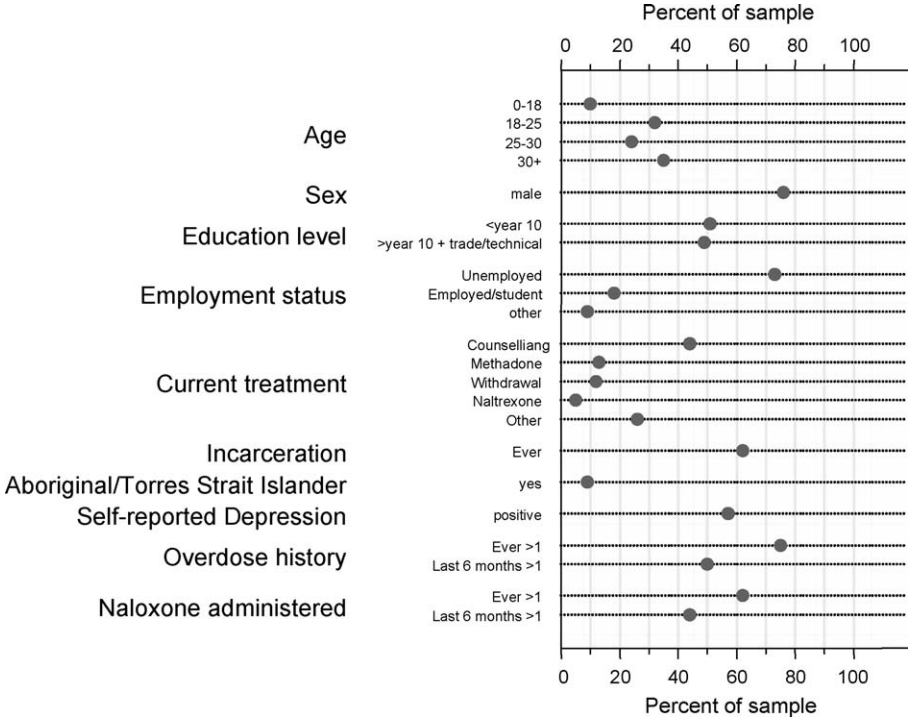

Fig. 1. Characteristics of study participants.

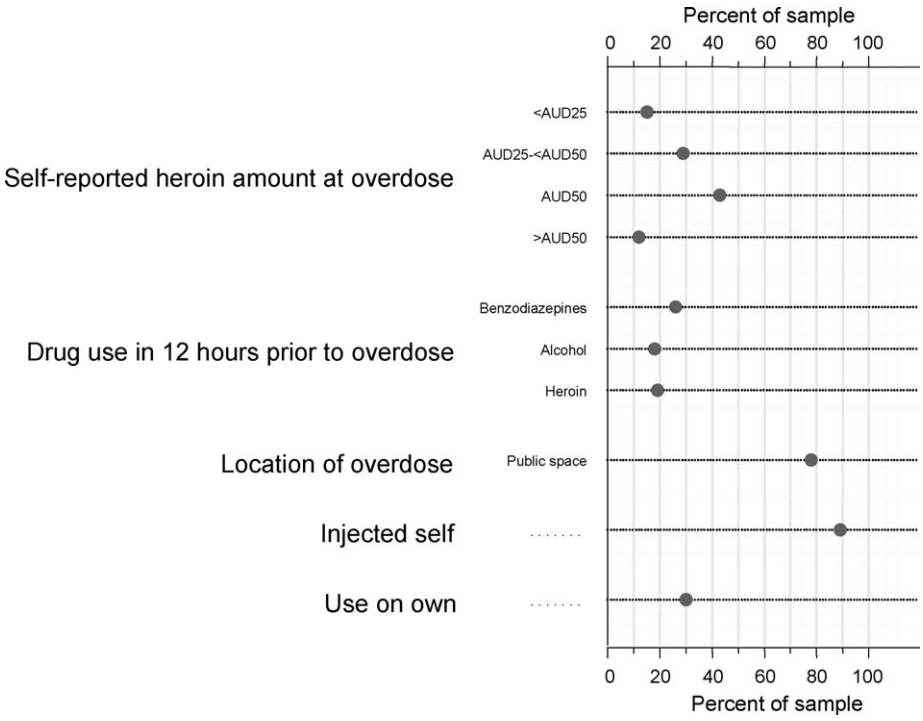

Fig. 2. Circumstances of the overdose targeted in the study.

3.4. Attributions of overdose

Fig. 3 shows participants' attributions of the causes of their most recent overdose. The majority attributed it to the quantity and/or quality of heroin used. Next came mixing heroin with benzodiazepines and/or alcohol. Most importantly there was a strong association between these attributions and reported risk behaviours, after controlling for confounders. In each case engagement in the risk behaviour in the 12 h prior to overdose was more likely among those attributing their overdose to that risk behaviour. The relevant odds rations are: amount of heroin used (OR = 1.85, 95% CI = 1.05–3.23), concurrent benzodiazepine use (OR = 10.00, 95% CI = 4.03–24.84) and concurrent alcohol use (OR = 61.41, 95% CI = 11.60–325.05).

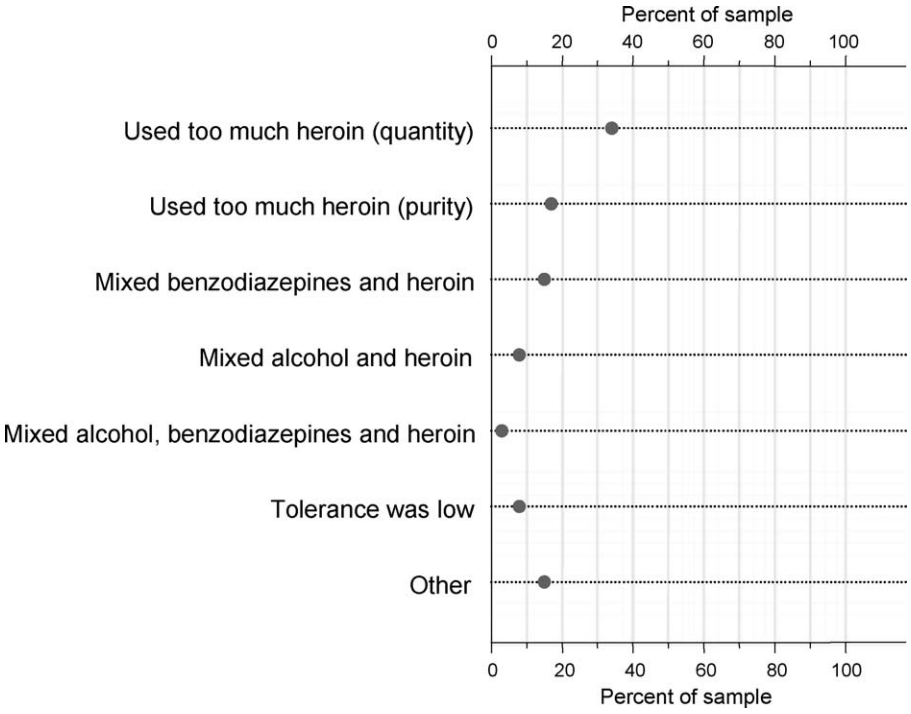

Fig. 3. Participants' attribution of cause of recent heroin overdose.

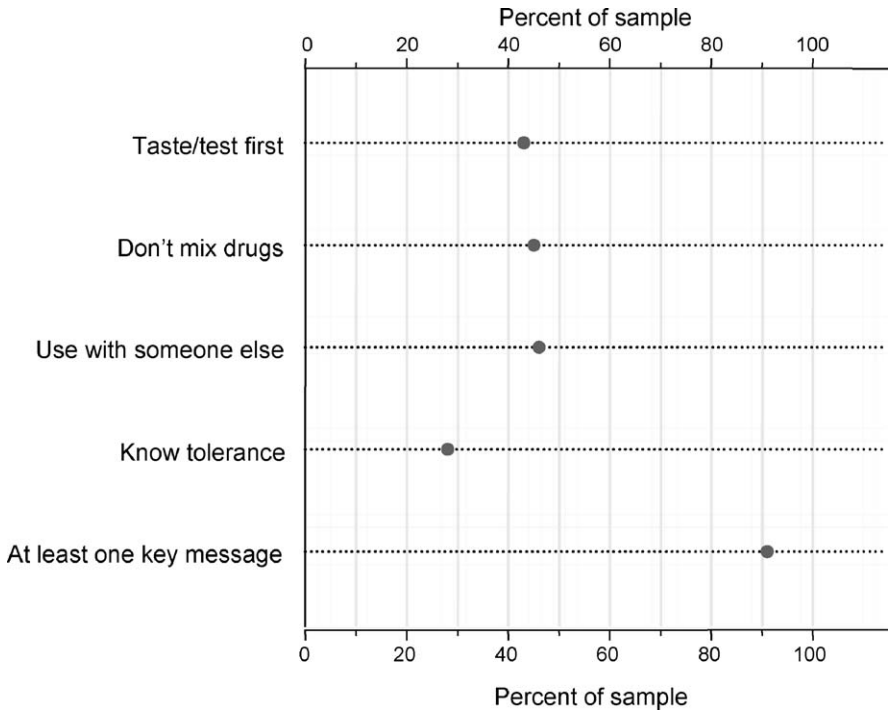

Fig. 4. Knowledge of overdose prevention messages among the sample.

3.5. Knowledge of overdose prevention messages

Fig. 4 shows that knowledge of overdose prevention messages was commonly reported with around 90% reporting knowledge of at least one message. With the exceptions discussed below, this knowledge was largely unrelated to participant characteristics, implying that the penetration of these messages was similar across the sociodemographic spectrum of the sample. However, knowledge of the 'sample first' message was less likely to be reported by those aged less than 18 years than those aged between 18 and 25 years (OR = 0.25, 95% CI = 0.07–0.89), and more likely to be reported among those who reported ever having experienced an additional overdose (OR = 2.96, 95% CI = 1.58–5.56). Knowledge of the 'don't mix drugs' message was unrelated to participant age, but more likely to be reported among those who reported injecting for more than 5 years (OR = 2.08, 95% CI = 1.01–4.27). Participants currently in treatment were more likely to report knowledge of the 'use with someone else' message (OR = 1.83, 95% CI = 1.02–3.29). Older participants and those reporting ever being incarcerated were less likely to report knowledge of the 'monitor/know tolerance' message, but those who reported never having had an additional overdose were more likely to report knowledge of this message.

3.6. Links between knowledge, behaviour and attributions

Table 1 shows the percentages of participants who reported engaging in selected risk behaviours for whom knowledge of pertinent overdose prevention messages was also available. Participants reporting knowledge of the 'don't mix drugs' message were 2.8 times as likely to report engaging in alcohol use in the 12 h prior to overdose, and almost twice as likely to report engaging in benzodiazepine use in the 12 h prior to overdose, than those who did not report this knowledge, after controlling for the effects of the remaining variables included in the model, which showed no effect. The only exception was that the effect of employment status noted above remained significant in the benzodiazepine use analysis (OR = 3.09, 95% CI = 1.29–7.42). There was also a weak relationship ($p = 0.083$) between knowledge of the 'don't use alone' message and an increased likelihood of reporting using alone at overdose. While knowledge of the 'sample first' message appeared associated with a non-significant protective effect in relation to this behaviour, it should be noted that 92% of the sample reported not engaging in this behaviour prior to overdose.

Participants who reported knowledge of overdose prevention messages and engagement in related behaviours may merely be

Table 1
Engagement in overdose risk practice and percentage reporting knowledge of related overdose prevention message and link between knowledge and behaviour

	% Total sample	% Engaging yet reporting knowledge of message	Adjusted OR (95% CI)
Used benzodiazepines in 12 h prior to overdose	25	59	1.97 (1.04–3.75)
Used alcohol in 12 h prior to overdose	17	65	2.93 (1.37–6.26)
Did not test heroin for strength prior to use	92	42	0.55 (0.19–1.58)
Used on own	29	55	1.72 (0.91–3.25)

expressing their attributions of overdose causation. In order to test for this possibility, associations between participants' specific attribution of overdose cause and knowledge of relevant messages were examined. There was only a weak relationship between attributing overdose cause to concomitant benzodiazepine use (OR = 2.12, 95% CI = 0.91–4.98) and the likelihood of reporting knowledge of the 'don't mix drugs' message with a similar finding evident for concomitant alcohol consumption (OR = 2.17, 95% CI = 0.69–6.77), after controlling for the remaining variables included in the model. The effect noted in relation to injecting career upon knowledge of the 'don't mix drugs' messages noted above remained significant in this analysis (OR = 2.09, 95% CI = 1.02–4.32).

4. Discussion

4.1. Overdose prevention education

Overdose prevention education is a key component of harm reduction work in Melbourne (Dietze et al., 2001a; Moore, 2004) and has been delivered in various forms, ranging from leaflet distribution within agencies to classroom-based overdose prevention workshops run by the Victorian Drug User Group since the late 1990s (VIVAIDS, S. Lord, personal communication, November 2005). Despite this, the 'market penetration' of these overdose prevention messages appears relatively low, with less than half of our sample reporting knowledge of each of the key messages. Our results are similar to those found in South Australia prior to the implementation of an intensive overdose prevention intervention (McGregor et al., 2001). To enhance knowledge of overdose prevention messages systematic campaigns need to be maintained over time. On the bright side, our results showed that knowledge appeared relatively uniform across the sociodemographic groups in our sample suggesting that the messages are reaching a broad cross-section of heroin users.

Our second major finding concerns the effectiveness of knowledge of risk reduction strategies in reducing overdose risk behaviour. In advocating for the dissemination of risk reduction messages, it is presumed that knowledge of risky practices will lead to a reduction in risk behaviours. However, as already indicated, the efficacy of these messages in producing individual behaviour change is largely untested, and the sociocultural context of heroin use may militate against their adoption (Moore, 2004). Indeed, while we did not manipulate an educational intervention directly, our study provides an indirect behavioural evaluation. We found that knowledge of overdose risk reduction strategies was associated with an increased prevalence of related risk behaviours, particularly in relation to the concomitant use of CNS depressant drugs. Importantly, this effect appeared largely independent of participants' attributions of overdose causation, suggesting that it was not a spurious effect of participants' attributions leading to increases in reports of overdose prevention messages. Indeed, knowledge (from prevention messages, experience and information from other heroin users, etc.) that mixing CNS depressants increases intoxication may encourage that risky practice in the cultural context in which heroin use takes place (Moore, 2004), a possibility consistent with the 'situated rationality' of risk behaviours (Bloor, 1995) detailed earlier.

We were initially surprised by our findings, but discovered analogous effects in other areas of public health. Nutrition research draws a distinction between 'declarative' and 'procedural' knowledge (Worsley, 2002), so in our case we should not have expected that knowledge of overdose risk behaviours (declarative knowledge) would produce decreased overdose risk if this risk cannot be avoided in situ (procedural knowledge). Consistent with this framework, our findings are more supportive of social models of risk knowledge and behaviour that allow for the valuation of risk in decision making around health behaviours. Our findings are especially important in the context of the widespread heroin 'drought' in Australia (Dietze and Fitzgerald, 2002), where heroin users may value the risk of overdose less than the importance of increasing their levels of intoxication in the context of poor heroin supply.

4.2. Circumstances and characteristics of non-fatal heroin overdose

Importantly, participants' reported engagement in overdose-related risk behaviours did not appear to vary substantially according to demographic characteristics, although previous overdose experience appeared to protect against the use of alcohol in the 12 h preceding the overdose event. Moreover, previous experience of incarceration was predictive of the experience of additional overdoses, highlighting the link between incarceration history and overdose risk (Seaman et al., 1998). Our finding that the more extensive experience of overdose among older participants was unaffected by the length of participants' injecting career is also key in that it contrasts with previous work (Darke et al., 1996a), and suggests that increased age alone is a significant risk factor for overdose. This finding contributes further to the puzzling age effects found in relation to heroin overdose, where older, experienced heroin users appear at greatest risk (Warner-Smith et al., 2001).

Despite this difference with the work of Darke et al. (1996a), our study found similar distributions of attributions for the current overdose, with the majority of our sample blaming the use of too much heroin (either through quality and/or quantity).

It is also useful to compare our sample with that in Darke et al. (1996a) key Australian study on non-fatal heroin overdose. Our sample was generally younger, more likely to be male, more likely to report incarceration, but less likely to be in treatment or report the use of other drugs. These differences may merely reflect the dynamics of the heroin-using population over time and across geographic region (recruitment for the study by Darke et al. was completed in Sydney some 7 years earlier) or differences in the way cases were ascertained (our study used a more restrictive definition of overdose).

4.3. Potential limitations

While this study represents a significant improvement over previous cross-sectional work in terms of sample ascertainment, definition of overdose and generalisability, weaknesses remain.

The free recall paradigm used to determine knowledge of overdose prevention strategies has the advantage of minimising recall bias compared to other mnemonic strategies. However, we may have found higher levels of knowledge using cued recall or recognition strategies that are known to be more efficient at eliciting information (Memon et al., 1997). More importantly, we did not adequately capture information on participants' mental state or dependence that may have affected our findings.

It is possible, of course, that heroin overdose prevention education may be effective in preventing some heroin users from ever experiencing an overdose and our study would not have captured this population. Nevertheless, over half of IDU samples typically report experience of at least one overdose (Dietze et al., 2001b) meaning that our findings are pertinent to, at the very least, half of the heroin-using population.

This study was cross-sectional in design and no education intervention was manipulated. This means that, while such education programs had been undertaken in Melbourne prior to our study, exposure to overdose risk reduction education was uncontrolled.

Finally, it may be that the results of the current study reflect a form of reverse causation. For example, among our sample those participants who used other CNS depressants may have been more likely to access services providing overdose prevention messages as this risk group may be the prime target group of these services. Unfortunately, the current dataset does not allow for such determination.

5. Conclusions

Overdose is common among heroin users and its prevention is, and should be, a key strategy in the reduction of drug related harm. In relation to overdose education we found that knowledge of overdose risk reduction strategies was associated with the paradoxical effect of increasing the prevalence of the target risk behaviours. These findings have implications for overdose prevention strategies targeted at individualised risk behaviour change, where it is generally presumed that increasing knowledge will lead to a reduction in risk behaviour. We urge caution when implementing overdose prevention education strategies and suggest that these strategies should focus upon promoting effective responses to overdose that could lead to the prevention of fatal overdose (e.g. 'always call an ambulance', where the behaviour relates to external, rather than internal risks). Indeed, we would argue that the focus of educative messages on those features of the heroin-using risk environment (Rhodes, 2002) that are unlikely to be changed by social marketing campaigns alone (Moore, 2004), is unwarranted and may be associated with negative outcomes. Further contextually sensitive research is required examining the efficacy of all overdose prevention strategies in order to identify effective interventions for reducing this key heroin related harm.

Acknowledgments

This study was supported by grants from the National Health & Medical Research Council and the Victorian Health Promotion Foundation. The first author is the recipient of a VicHealth Public Health Research Fellowship. All authors were independent of these research funding sources and there were no competing interests for any of the authors. Mr. Greg Cooper (Metropolitan Ambulance Service, Melbourne) facilitated data collection and Mr. Stephen Burgess (Monash University) and Dr. Greg Rumbold (Monash University) assisted in the design of the study. This study was approved by the University of Melbourne Human Research Ethics Committee.

References

Aitken, C., Moore, D., Higgs, P., Kelsall, J., Kerger, M., 2002. The impact of a police crackdown on a street scene: evidence from the street. Int. J. Drug Pol. 13, 193–202.

Aloisi, M.S., Girardi, E., Ippolito, G., 1995. AIDS-related knowledge and sex behavior: a review of Italian studies of young people. Ann. Ig. 7, 349–358.

Bennett, G.A., Higgins, D.S., 1999. Accidental overdose among injecting drug users in Dorset, UK. Addiction 94, 1179–1180.

Bloor, M., 1995. The users guide to contrasting theories of HIV related risk behaviour. In: Gabe, J. (Ed.), Medicine, Health and Risk: Sociological Approaches. Cambridge Blackwell, Oxford, pp. 19–31.

Chicago Recovery Alliance, 2002. Opiate OD Prevention/Intervention Work in Chicago. http://www.anypositivechange.org/OD1202.pdf, accessed on 3/5/2005.

Darke, S., Hall, W., 2003. Heroin overdose: research and evidence-based intervention. J. Urban Health 80, 189–200.

Darke, S., Ross, J., Hall, W., 1996a. Overdose among heroin users in Sydney, Australia I: prevalence and correlates of non-fatal overdose. Addiction 91, 405–411.

Darke, S., Ross, J., Hall, W., 1996b. Overdose among heroin users in Sydney, Australia II: responses to overdoses. Addiction 91, 413–417.

Dietze, P., Fitzgerald, J., 2002. Interpreting changes in heroin supply in Melbourne: droughts, gluts or cycles? Drug Alcohol Rev. 21, 295–303.

Dietze, P., Fry, C., Rumbold, G., Gerostamoulos, J., 2001a. The context, management and prevention of heroin overdose in Victoria, Australia: the promise of a diverse approach. Addic. Res. Theory 9, 437–458.

Dietze, P., Fry, C., Rumbold, G., Gerostamoulos, J., 2001b. The context, management and prevention of heroin overdose in Victoria: the promise of a diverse approach. Addict. Res. Theory 9, 437–458.

Dietze, P., Cantwell, K., Burgess, S., 2002a. Bystander resuscitation attempts at heroin overdose: does it improveoutcomes? Drug Alcohol Depend. 67, 213–218.

Dietze, P., Fry, C., Sunjic, S., Bammer, G., Zador, D., Jolley, D., Rumbold, G., 2002b. Using ambulance attendances to recruit people who have experienced non-fatal heroin overdose. Drug Alcohol Depend. 67, 99–103.

Dietze, P., Jolley, D., Fry, C., Bammer, G., 2005. Transient changes in behaviour lead to heroin overdose: results from a case-crossover study of non-fatal overdose. Addiction 100, 636–642.

Ferron, C., Laurent-Beq, A., Deschamps, J.P., 1993. Adolescents and AIDS: knowledge, attitudes, behaviors, perceptions and consequences for prevention. Can. J. Public Health 84, 209–274.

Fisher, R.P., Geiselman, R.E., Amador, M., 1989. Field test of the Cognitive Interview: enhancing the recollection of actual victims and witnesses of crime. J. Appl. Psychol. 74, 722–727.

Gibson, D.R., Choi, K.H., Catania, J.A., Sorensen, J.L., Kegeles, S., 1993. Psychosocial predictors of needle sharing among intravenous drug users. Int. J. Addict. 28, 973–981.

Heale, P., Dietze, P., Fry, C., 2003. Intentional overdose among heroin overdose survivors. J. Urban Health 80, 230–237.

McGregor, C., Ali, R., Christie, P., Darke, S., 2001. Overdose among heroin users: evaluation of an intervention in South Australia. Addict. Res. Theory 9, 481–502.

Memon, A., Wark, L., Holley, A., Bull, R., Koehnken, G., 1997. Eyewitness performance in cognitive and structured interviews. Memory 5, 639–656.

Miller, P., 2002. Dancing with death: risk, health promotion and injecting drug users. Unpublished Ph.D. Thesis. Deakin University, Geelong, Victoria, Australia.

Moore, D., 2004. Governing street-based injecting drug users: a critique of heroin overdose prevention in Australia. Soc. Sci. Med. 59, 1547–1557.

MSIC Evaluation Committee, 2003. Final Report on the Evaluation of the Sydney Medically Supervised Injecting Centre. Sydney, Authors.

Rhodes, T., 2002. The 'risk environment': a framework for understanding and reducing drug-related harm. Int. J. Drug Pol. 13, 85–94.

Seaman, S.R., Brettle, R.P., Gore, S.M., 1998. Mortality from overdose among injecting drug users recently released from prison: database linkage study. Br. Med. J. 316, 426–428.

Tapia-Aguirre, V., Arillo-Santillan, E., Allen, B., Angeles-Llerenas, A., Cruz-Valdez, A., Lazcano-Ponce, E., 2004. Associations among condom use, sexual behavior, and knowledge about HIV/AIDS. A study of 13,293 public school students. Arch. Med. Res. 35, 334–343.

Warner-Smith, M., Darke, S., Lynskey, M., Hall, W., 2001. Heroin overdose: causes and consequences. Addiction 96, 1113–1125.

Williams, G., Popay, J., Bissell, P., 1995. Public health risks in the material world: barriers to social movements in health. In: Gabe, J. (Ed.), Medicine, Health and Risk: Sociological Approaches. Cambridge Blackwell, Oxford, pp. 113–133.

Worsley, A., 2002. Nutrition knowledge and food consumption: can nutrition knowledge change food behaviour? Asia Pac. J. Clin. Nutr. 11, 579–585.