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ORIGINAL ARTICLE

Substance use, sleep and intervention design: insights from qualitative data

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Abstract

Background: Alcohol and other drug use is associated with poor sleep quality and quantity, but there is limited qualitative research exploring substance users' experiences of sleep and few psychosocial sleep interventions for them.
Aim: To inform the development of psychosocial interventions to improve sleep amongst people reporting drug/alcohol problems.
Method: Qualitative data were collected during a sleep survey. Of the 549 drug/alcohol users completing the survey, 188 (34%) provided additional information about their sleep using a free text box. Responses were analysed via Iterative Categorisation. Findings were reviewed with reference to the Behaviour Change Wheel (BCW).
Results: All data were categorised inductively under five headings: (i) sleep quality; (ii) nature of sleep problems; (iii) sleep and substances; (iv) factors improving sleep quality; (v) factors undermining sleep quality. Substance use undermined sleep, but poor sleep often persisted after substance use had ceased. Sleep problems were diverse; as were the causes of, and strategies for dealing with, those problems. Causes and strategies had biological, psychological, social and environmental roots.
Conclusions: The BCW facilitated the identification of intervention components that might improve the sleep of people who use substances. These components relate to education, training, enablement, modelling, service provision, guidelines and environment.

Keywords

Substance use, sleep, intervention design, behaviour change, qualitative, survey

History

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Introduction

Illicit and non-medical psychoactive substance use is linked to poor sleep quality and quantity (Arnedt et al., 2012; Burke et al., 2008; Escobar-Cordoba et al., 2009; Hasler et al., 2014). Nonetheless, there is limited qualitative research on substance users' subjective experiences of sleep. Exceptions to this include studies exploring linkages between sleep and recovery from heroin use (Neale et al., 2012; Nettleton et al., 2011) and sleep in residential drug and alcohol treatment settings (Nettleton et al., 2017). This research has found that opiate users want to sleep better, and complain that sleep problems cause them to feel distressed, exhausted and unable to cope (Neale et al., 2012; Nettleton et al., 2011, 2017). Analyses have also shown that ''sleep'' and ''awake'' are not dichotomous states; rather, sleep in residential drug and alcohol treatment is a complex ''practice'' or ''assemblage'' including worrying, resting, fidgeting, thinking, clock watching, smoking, chatting, dozing and dreaming (Nettleton et al., 2017).

Increasingly, researchers and clinicians are developing psychosocial interventions to assist people in changing their health-related behaviours in ways that should improve their broader quality of life and well-being. Psychosocial interventions are commonly used in treating substance use disorders (Babor et al., 2007; Cooper et al., 2015; Higgins & Petry, 1999; Li et al., 2016; Magill & Ray, 2009) and sleep problems (Baron et al., 2017; Ellis et al., 2015; Morin et al., 1999). There are, however, few psychosocial interventions explicitly designed to improve the sleep of people who report a problem with drugs or alcohol. Cognitive-behavioural therapies targeting insomnia in adult patients with alcohol use disorders have been developed, but these do not necessarily change drinking behaviours (Arnedt et al., 2011; Currie et al., 2004) or reduce relapse to drinking (Roth, 2009) even if they improve sleep in this population (Brower, 2015). A meta-

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analysis of behavioural therapies for alcohol-related disorders and accompanying sleep disturbances has, meanwhile, reported that methodological weaknesses limit the conclusions that can be drawn regarding intervention efficacy and there is a need for patient-centred research, including qualitative methods, to inform future intervention development (Brooks & Wallen, 2014).

One recognised method for characterising and designing behaviour change interventions is the behaviour change wheel (BCW; Michie et al., 2011). At the centre of the BCW are three conditions required to modify behaviour: ''Capability'', ''Opportunity'' and ''Motivation'', collectively known as the COM-B system. The COM-B system is surrounded by nine intervention functions: ''Education'', ''Persuasion'', ''Incentivisation'', ''Coercion'', ''Training'', ''Enablement'', ''Modelling'', ''Environmental Restructuring'' and ''Restrictions''. These nine intervention functions address deficits in one or more of the three behavioural conditions. The outer circle of the BCW then comprises seven policy categories: ''Guidelines'', ''Environmental/Social Planning'', ''Communication/Marketing'', ''Legislation'', ''Service Provision'', ''Regulation'' and ''Fiscal Measures''. The seven policy categories facilitate the nine intervention functions.

The BCW offers a more comprehensive analytical framework than most other frameworks of behaviour change since it does not restrict itself to cognitive processes, but instead understands behaviour in relation to its context, including the social and physical environment. If applied theoretically to sleep, the BCW would posit that to change their sleep pattern an individual would require the physical and psychological ''Capability'' and knowledge to sleep differently; an environment, financial circumstances and social relationships that afford ''Opportunity'' to sleep differently; and autonomic desires or impulses as well as self-conscious, self-directed ''Motivations'' to sleep differently. If any of these components were weak or absent, interventions and policies would be needed to increase the individual's resources, such that a change in sleep would become possible.

The aim of this paper is to inform the development of psychosocial interventions to improve sleep amongst people reporting drug or alcohol problems. Service user voices are often absent when research and intervention development agendas are set (Robotham et al., 2016; Trivedi & Wykes, 2002), and we here seek to counter this by exploring the accounts of people who identify as having (or having had) a problem with drugs and/or alcohol. We also review our findings with reference to the BCW. Although the BCW has not previously been used to explore sleep amongst people who use substances, it has been reliably applied to other public health interventions, such as tobacco control and obesity (Michie et al., 2011). Moreover, it fits well with the extant qualitative research, which has emphasised that sleep amongst drug and alcohol users is a complex material, social, normative and affective practice – not simply a cognitive process (Nettleton et al., 2017).

Methods

Data were generated via a short self-complete survey conducted as part of a wider study designed to produce a new Patient Reported Outcome Measure (PROM) of sleep quality amongst people in recovery from drug and/or alcohol dependence (Neale & Strang, 2015a,b). Development and validation of the PROM will be reported separately. The survey was open to any current or former drug or alcohol user, without any pre-screening for sleep problems. The survey was undertaken in paper format in community drug and alcohol treatment services, homelessness services and peer support services in three UK cities between December 2015 and May 2016. It was also made available for online completion between April 2016 and July 2016 (a link to the survey was circulated to service user organisations and treatment services via social media and email). Participants who completed the paper version were offered refreshments to compensate for their time. No compensation was offered to those completing the survey online.

At the end of the survey, there was a free text box inviting respondents to ''write anything else you would like to tell us about your sleep''. In total, 549 individuals completed the survey (442 on paper and 107 online). Of these, 188 (34%) provided additional information about their sleep using the free text box (four others provided responses that could not be interpreted so these had to be deleted). Basic demographic, substance use and sleep characteristics of all individuals completing the survey are shown in Table 1. Given the diverse range of substances used (depressants, stimulants, hallucinogens and analgesics; in different quantities and often in complex and changing combinations) and the varying lengths of problem substance use and abstinence reported, respondents were categorised pragmatically based on their self-reported behaviour in the last 6 months: ''no substances''; ''only drugs''; ''only alcohol'' and ''both drugs and alcohol''.

Table 1 shows significant differences between the 188 respondents providing analysable free text responses and the 357 who did not write any free text. Individuals providing free text responses were more likely to be female ($\chi^2 = 8.865$, $df = 1$, $p = 0.003$), White ($\chi^2 = 6.792$, $df = 1$, $p = 0.009$), older ($t = -3.551$, $df = 424.44$, $p < 0.001$), abstinent/not using drugs only in the last 6 months ($\chi^2 = 22.303$, $df = 3$, $p < 0.001$), not homeless ($\chi^2 = 5.748$, $df = 1$, $p = 0.017$), in paid work ($\chi^2 = 6.841$, $df = 1$, $p = 0.009$) and diagnosed with insomnia ($\chi^2 = 4.121$, $df = 1$, $p = 0.042$). They included 102 (54.3%) males and 86 (45.7%) females; were mostly White ($n = 165$ or 87.8%), had a mean age of 47 years (range 24–71 years), and said that they had had a problem using substances for a mean of 20 years (range 0–50 years). In the last 6 months, 40 (21.3%) reported a problem with drugs, 55 (29.3%) reported a problem with alcohol, 37 (19.7) reported a problem with both drugs and alcohol and 56 (29.9%) reported no problem substance use. In the last month, 17 (9.0%) had been homeless, 43 (22.9%) had had paid legal work and 17 (9.1%) had been in residential treatment. In total, 50 (26.6%) had ever been diagnosed as having a sleep disorder (sleep apnoea, narcolepsy, restless legs syndrome or insomnia).

The 188 free text responses (range = 1 to 319 words) were exported into a Microsoft Word document and analysed inductively using Iterative Categorisation (Neale, 2016). This involved reviewing all text segments line-by-line, distilling the essence of all text segments into simple statements, then iteratively ordering, re-ordering and grouping all statements into meaningful categories. Once complete, all content was

Table 1. Demographic, substance use and sleep characteristics.

	Respondents without free text comments ($n = 357$)	Respondents with free text comments ($n = 188$)[a]	All sample ($n = 549$)	Comparison
Gender				
Males	240 (**67.2**%)	102 (**54.3**%)	342 (62.8%)	$\chi^2 = 8.865$, df = 1, $\mathbf{p = 0.003}$
Females	117 (32.8%)	86 (45.7%)	203 (37.2%)	
Ethnicity				
White (British, Irish, Other)	281 (**78.7**%)	165 (**87.8**%)	446 (81.8%)	$\chi^2 = 6.792$, df = 1, $\mathbf{p = 0.009}$
Other	76 (21.3%)	23 (12.2%)	99 (18.2%)	
Age (years)				
Mean	**43.5**	**46.5**	44.5	$t = -3.551$, df = 424.44, $\mathbf{p < 0.001}$
SD	10.1	8.9	9.8	
Range (min-max)	46 (20-66)	47 (24-71)	51 (20-71)	
Years with drug/alcohol problems				
Mean	20.1	19.99	20.1	$t = 0.116$, df = 423.258 $p = 0.908$
SD	11.4	10.1	10.9	
Range (min-max)	47 (0-47)	50 (0-50)	50 (0-50)	
Any substance use in the last 6 months				
None	49 (**13.8**%)	56 (**29.9**%)	105 (19.4%)	$\chi^2 = 22.303$, df = 3, $\mathbf{p < 0.001}$
Only drugs	105 (**29.7**%)	40 (**21.3**%)	145 (26.8%)	
Only alcohol	103 (29.1%)	55 (29.3%)	158 (29.2%)	
Both drugs and alcohol	97 (27.4%)	37 (19.7%)	134 (24.7%)	
Homeless in the last month				
No	298 (**83.5**%)	171 (**91.0**%)	469 (86.1%)	$\chi^2 = 5.748$, df = 1, $\mathbf{p = 0.017}$
Yes	59 (16.5%)	17 (9.0%)	76 (13.9%)	
Paid legal work in the last month				
No	307 (**86.0**%)	145 (**77.1**%)	452 (82.9%)	$\chi^2 = 6.841$, df = 1, $\mathbf{p = 0.009}$
Yes	50 (14.0%)	43 (22.9%)	93 (17.1%)	
Residential treatment in the last month				
No	310 (87.1%)	170 (90.9%)	480 (88.6%)	$\chi^2 = 1.554$, df = 1, $p = 0.213$
Yes	45 (12.9%)	17 (9.1%)	62 (11.4%)	
Ever diagnosed with sleep apnoea				
No/Don't know	338 (95.5%)	185 (98.4%)	522 (96.5%)	$\chi^2 = 3.122$, df = 1, $p = 0.077$
Yes	16 (4.5%)	3 (1.6%)	19 (3.5%)	
Ever diagnosed with narcolepsy				
No/Don't know	349 (98.9%)	185 (98.4%)	534 (98.7%)	Fisher's exact test: $p = 0.699$
Yes	4 (1.1%)	3 (1.6%)	7 (1.3%)	
Ever diagnosed restless legs syndrome				
No/Don't know	325 (92.1%)	172 (91.5%)	497 (91.9%)	$\chi^2 = 0.055$, df = 1, $p = 0.815$
Yes	28 (7.9%)	16 (8.5%)	44 (8.1%)	
Ever diagnosed with insomnia				
No/Don't know	294 (**83.3**%)	143 (**76.1**%)	437 (80.8%)	$\chi^2 = 4.121$, df = 1, $\mathbf{p = 0.042}$
Yes	59 (16.7%)	45 (23.9%)	104 (19.2%)	

[a]An additional four individuals provided responses that could not be interpreted so are treated as missing.
The exact significance is stated in the bold font.

successfully categorised under five headings: (i) sleep quality, (ii) nature of sleep problems, (iii) sleep and substances, (iv) factors improving sleep quality and (v) factors undermining sleep quality. We use these five headings to structure our findings below, and include free text extracts to illustrate key points. The text extracts are labelled with each respondent's gender, age and substance(s) use in the last 6 months. In the ''Discussion'' section, the BCW is used to help interpret our findings.

Findings

(i) Sleep quality

Respondents mostly referred to their sleep in negative or very negative terms; emphasising that they did not get enough sleep, and desperately wanted to sleep ''better'', ''longer'', ''properly'' or ''less erratically''. For some, the inability to sleep well was described as slowly ''killing them'' or as ''torture'':

> I wish I could sleep better. [Male, 39 years, drug use]
>
> It is a mental torture. [Female, 59 years, alcohol use]

Relatively few respondents said that their current sleep was ''good'' or that they woke up ''refreshed'' or ''energetic''. Instead, they described feeling constantly tired and exhausted. Some expressed exasperation and/or frustration that they could not maintain a paid job or function effectively during the day because of tiredness. Others explained that they ''napped'' or drank large quantities of caffeine to keep themselves alert – although they recognised that this then inhibited their sleep the following evening:

> I wake around 4am and spend the day tired.'' [Male, 45 years, drug use]
>
> I am exhausted most of the time.'' [Female, 36 years, drug and alcohol use]

(ii) Nature of sleep problems

When respondents elaborated on the type of sleep problems they experienced, the main difficulty identified was poor quality sleep occasioned by constantly waking up in the night:

> I wake up several times every night.'' [Male, 56 years, no substance use]
>
> I wake up too often. [Male, 45 years, alcohol use]

In addition, many complained of frightening nightmares, vivid dreams and hallucinations that unsettled them throughout the next day. These often related to people they knew and situations that they considered to be stressful, including being in treatment and detoxing:

> I hate the disturbing dreams I have. [Female, 36 years, no substance use]
>
> Sometimes I get hallucinations. [Male, 54 years, alcohol use]

Some respondents complained of sleeping too much and yet still feeling tired, or of collapsing exhausted onto the bed at all times of day and night. In contrast, several others bemoaned prolonged periods of not sleeping at all, sometimes for days and weeks at a time:

> At the moment I seem to sleep too much and still feel tired. [Male, 53 years, no substance use]
>
> I can go long periods of time without sleep, ranging from two days to as long as four, possibly five, days. [Male, 24 years, alcohol use]

Whilst respondents often spoke of difficulties falling asleep, few complained of early morning wakening:

> It takes ages to get sleep. [Female, 55 years, alcohol use]
>
> I can't quiet my brain to sleep on my own. [Female, 43 years, no substance use]

(iii) Sleep and substances

Links between sleep and substance use, but also between sleep and the use of prescribed medications, were repeatedly emphasised. These relationships were, however, complex and contradictory. Thus, many respondents attributed sleep problems to their drinking or drug use, or indicated that drinking or drug use exacerbated prior sleep problems:

> I used to have lots of trouble with sleep when I was drinking. [Female, 43 years, no substance use]
>
> The deep, prolonged sleep I experienced under the influence of heroin was not natural. [Male, 47 years, no substance use]

Despite this, several respondents stated that they used street drugs (particularly cannabis) or alcohol either just before bed or during the night to help them sleep; often adding that without these substances they could not sleep:

> I smoke cannabis to help me get to sleep. [Female, 25 years, drug and alcohol use]
>
> I use cannabis in the night to sleep. [Male, 43 years, drug use]

Respondents also frequently reported that they took prescribed medications (especially anti-depressants, analgesics and sleeping medications) to improve their sleep or to combat pain, anxiety or insomnia. Furthermore, some suggested that taking prescribed drugs to aid sleep was a positive choice or a ''lesser evil'' since it prevented them from misusing other more harmful substances:

> I get headaches from lack of sleep and sometimes take codeine to help me sleep. [Female, 52 years, no substance use]
>
> With the meds I get a really good sleep and don't need drugs or drink. [Male, 45 years, drug use]

Still others stated that taking prescribed medications (particularly antidepressants) undermined their sleep. Indeed, some were so worried about becoming addicted to sleeping aids that they avoided them at all costs or only took them ''as a last resort'':

> I was prescribed anti-depressants last year... since then, the sleep has got really bad.'' [Female, 37 years, no substance use]
>
> I don't want to be prescribed drugs as they're addictive. [Female, 56 years, drug use]

(iv) Factors improving sleep quality

Respondents who reported that they were no longer misusing substances (especially alcohol) and/or who described themselves as being ''in recovery'' overwhelmingly stated that their sleep had improved greatly since detoxing. Further, some clarified that it had continued to improve the longer they did not consume alcohol or other drugs and others added that it had eventually returned to ''normal'':

> Since starting detox my sleep is improving. [Male, 55 years, alcohol use]
>
> I stopped drinking eighteen months ago and now sleep much better. [Female, 43 years, no substance use]
>
> I've been sober three years and my sleep has got progressively better. [Female, 57 years, no substance use]

Other strategies which respondents had adopted to improve their sleep quality, particularly to help them fall asleep, included more daytime exercising, limiting caffeine intake (especially later in the day), trying to have a routine before bed, relaxing before bed, meditation, hypnotherapy, watching television in bed, being happy, or reducing their expectations about the kind of sleep quality they would achieve:

> Exercise helps me sleep. [Male, 30 years, drug use]

I have stopped taking any stimulants, including alcohol, cocaine, codeine-based over-the-counter medication and no coffee after eleven in the morning. [Female, 42 years, drug and alcohol use]

I had to change my expectations about what constituted a good night's sleep and align them with ''reality''. [Male, 47 years, no substance use]

(v) Factors undermining sleep quality

A reduction in substance use or abstinence did not, however, guarantee restful sleep. On the contrary, some respondents noted how their sleep had worsened during detoxification, often due to racing thoughts and withdrawal symptoms such as shaking, sweating and vomiting. Others explained that they still struggled to sleep despite having already been abstinent for a period of months or years:

When I stop drinking, I go through three to five nights and days of shaking, unable to sleep, sweating, vivid dreams. [Male, 65 years, alcohol use]

I have been in recovery for ten years (fully abstinent from drugs and alcohol), but still experience poor sleep quality, anxiety at night and traumatic dreams. [Female, 36 years, no substance use]

Respondents often linked their sleep problems to factors beyond their substance use; one of the most common explanations being poor mental health, both diagnosed mental health conditions and more generalised anxiety, including self-perpetuating concerns about not being able to sleep:

My sleep pattern can be disturbed by my bipolar affective disorder. [Female, 36 years, drug use]

I believe anxiety is the key cause for my sleep problems. [Female, 37 years, alcohol use]

Chronic pain and diagnosed sleep disorders were also identified as undermining sleep quality. Other bodily causes of sleep disruption included desires or cravings to eat during the night (especially sugar), needing the toilet, experiencing withdrawal symptoms, night sweats, cramps or having bad dreams or nightmares:

I have a chronic pain condition that keeps me awake. [Female, 47 years, alcohol use]

I have apnoea that can be more frequent at times and alarming for my partner. [Male, 52 years, no substance use]

I wake up a lot because of night sweats. [Male, 54 years, drug use]

Many respondents additionally discussed social factors associated with their broader life circumstances or lifestyle that disrupted their sleep or created stresses that undermined their sleep quality. These included having babies or small children who cried or needed attention during the night; family or relationship difficulties that resulted in bedtime arguments or worries that stopped them from sleeping; past trauma, including childhood sexual abuse that now made it impossible to relax in bed; being homeless and feeling unsettled and unstable; having a disrupted sleep pattern from working nightshifts; not having a daily structure or routine; work-related stresses; lack of exercise; being ''undisciplined'' about sleep; drinking too much caffeine; and feeling generally unhappy:

I have a lot of stress from work keeps me awake. [Male, 58 years, no substance use]

My sleep would be better if I had more discipline. [Female, 52 years, drug and alcohol use]

I hate my life; that's why I can't sleep. [Female, 45 years, drug use]

Other factors that were identified as impeding sleep were environmental, such as living in a hostel or residential treatment setting (particularly if others were using substances during the night), feeling unsafe, noise, intrusive smells or simply having an uncomfortable bed:

This environment [homeless hostel] doesn't help me to sleep. Too noisy and dangerous people. [Male, 45 years, drug use]

My upstairs neighbour wakes me up every single night with loud music. [Female, 37 years, no substance use]

Lastly, some respondents referred to being a lifetime ''light'' or ''poor'' sleeper or explained that they had always slept ''badly'', even as a child:

I'm a light sleeper. [Male, 55 years, alcohol use]

I don't think it's just using drugs affecting my sleep. Even when I was young I have had problems getting to sleep and staying asleep. [Female, 47 years, drug and alcohol use]

Discussion

Our findings add to existing evidence that poor sleep, and associated tiredness and exhaustion, concern many people who use, or who have used, drugs or alcohol problematically (Neale et al., 2012; Nettleton et al., 2011, 2017). We have also provided further evidence that this population reports a strong desire to sleep ''better''; thus indicating a potential willingness to receive assistance with their sleep problems (BCW condition: ''Motivation''). Our data additionally support previous research that has highlighted the complex and contradictory nature of sleep amongst substance users (Nettleton et al., 2017). Indeed, our respondents routinely reported broken sleep, disturbing dreams, nightmares, hallucinations, sleeping too much, prolonged wakefulness and difficulties falling asleep.

Many of our survey respondents recognised that substance use undermined their sleep quality and reported that reduced substance use or abstinence was a key factor improving their sleep. Others believed that their use of substances,

particularly cannabis and alcohol, facilitated their sleep. These conflicting perspectives are not irreconcilable since the physiological effects of different substances and different quantities of substances on the human body are varied (Arnedt et al., 2012; Conroy & Arnedt, 2014). Furthermore, perceptions of sleep quality often do not align neatly with more objective sleep measures (Kushida et al., 2001; Lockley et al., 1999; Unruh et al., 2008). It is therefore possible for people to believe that substances are facilitating sleep when they may in fact be undermining it (or vice versa) (Arnedt et al., 2012; Feinberg et al., 1975; Morgan et al., 2006; Nicholson et al., 2004). These findings remind us that ability to change sleep (BCW condition: ''Capability'') can be affected ''physiologically'' and ''psychologically'' by pharmacology.

From the above, it seems reasonable to suggest that any intervention to address drug or alcohol-related sleep problems might beneficially include clear information (BCW function: ''Education'') on what is currently known about the effects of drugs and alcohol on sleep and the body. Given that prescribed drugs are also frequently misused and can cause addiction (Compton & Volkow, 2006; Tjagvad et al., 2016), this information would need to encompass the effects of the use and misuse of prescribed medications. Further, any potential role for prescribed sleep medications (BCW function: ''Enablement'') would need careful consideration. Our data suggest that some individuals would welcome and potentially benefit from prescribed sleeping aids whilst others would be too concerned about the risks of dependence (Hoyer & Jacobson, 2013). Such discussions would need to be part of any intervention and treatment decision-making processes.

In addition to reduced substance use, respondents identified other strategies that facilitated their sleep. Some strategies (increased exercise, limited caffeine intake, a bedtime routine, relaxation, meditation, hypnotherapy, changing expectations about sleep) are not novel and would be consistent with more generic information on ''sleep hygiene'' (Irish et al., 2015). In terms of BCW functions, they might be labelled ''Education'', ''Training'' and ''Enablement''. Other strategies (for example, watching television in bed) are more contentious, whilst others (for example, being happy) might be more aspirational than practical. Although these techniques may not all be ''evidence-based'', we should not underestimate the power of personal testimony and the reassurance and hope that can often be derived from the accounts of ''experts by experience'' (Borkman, 1976). Any sleep intervention should thus, whenever possible, incorporate the advice of those who have already tried particular sleep strategies and concluded that they work (BCW function: ''Modelling'').

One challenge to emerge from the data was the finding that respondents who had reduced or ceased their substance use still reported that their sleep was poor. Persisting sleep problems after substance cessation have also been documented in the clinical literature (Brower, 2015; Hasler et al., 2012). Whilst it may be relatively easy to explain to people that their sleep will probably worsen during a short period of detoxification, it is likely to be more difficult for them to hear that their sleep will still be causing them major problems weeks, months or even years after they have ceased using any substances. Nonetheless, our respondents' explanations for these more persistent and intractable sleep difficulties reveal critical biographical psychological, physical, social and environmental factors that can undermine sleep (BCW conditions: ''Opportunity'' and ''Capability''). Accordingly, intervention developers need to look beyond substance use; taking into account the wider range of personal circumstances and behaviours that can impede sleep (c.f. Brower, 2015).

Respondents highlighted how their sleep was negatively affected by poor mental health (both diagnosed mental health conditions but also more generalised anxiety); physical health problems (including pain and diagnosed sleep disorders); bodily needs and functions (such as hunger, urination, sweating and dreaming); social factors (family circumstances, previous traumas, domestic and work-related stresses); environmental factors (poor housing or homelessness, feeling unsafe, noise, smells, an uncomfortable bed) and personal biographies of poor or light sleeping. Most of these problems are unlikely to be improved by a sleep intervention conducted in isolation. Nonetheless, identifying and discussing these difficulties may still be instructive; enabling people to see why their ''Capability'' and ''Opportunity'' to sleep remain poor, despite reduced substance use or abstinence, and clarifying wider aspects of their lives that may need to be altered or for which they may need additional support.

Our analyses have weaknesses and strengths. Respondents in the main survey were self-selecting and those providing free text comments differed from those who did not on key demographic, substance use and sleep variables. Our findings are therefore not statistically generalisable. Furthermore, our data were generated via a single open text box at the end of a structured questionnaire; as such, responses lack the depth and detail that is ordinarily achieved through qualitative research. More positively, we successfully captured the subjective experiences and concerns of a large number of individuals with diverse demographic, substance use and sleep characteristics (more so than would likely have been possible using standard qualitative techniques). These have produced new insights into a hitherto poorly understood topic: current and former drug and alcohol users' subjective experiences of sleep and sleep quality. Moreover, the qualitative data that participants proactively offered have – when considered with reference to the BCW – provided useful information to inform the design of psychosocial interventions to improve sleep amongst this population.

Conclusions

Accounts of sleep provided by people experiencing problems with drugs or alcohol offer important insights for intervention design. Our respondents confirmed that substance use undermines sleep quality and quantity (Arnedt et al., 2012; Burke et al., 2008; Escobar-Cordoba et al., 2009; Hasler et al., 2014), but also revealed that poor sleep can persist even after substance use has reduced or ceased. The types of sleep problems identified were diverse; as were accounts of the causes of, and strategies for dealing with, those problems. Indeed, causes and strategies were rooted in biological, psychological, social and environmental factors. Sleep interventions must therefore move beyond substance use and begin to address these complex factors if they are to be effective.

Mapping our findings onto the nine BCW functions suggests that interventions should, at a minimum, include ''Education'' about drugs and alcohol and their effects on sleep and the body; ''Education'', ''Training'' and ''Enablement'' in relation to the potential benefits of exercise, reduced caffeine intake, bedtime routines, relaxation and the heterogeneity of sleep needs; carefully considered ''Enablement'' via the use of sleep medications; and ''Modelling'' based on the accounts and experiences of those who have already managed to address their sleep problems, and those currently working to overcome sleep problems. In terms of the broader BCW policy categories that might facilitate sleep, organisations routinely working with drug and alcohol users should afford sleep greater priority and attention by offering information, advice and support (BCW: ''Service Provision''). Further, residential settings (for example, detoxification units, rehabilitation centres, prisons and hostels) should produce protocols on sleep etiquette in shared sleeping spaces (BCW: ''Guidelines'') and commit to providing clean, quiet and safe places in which everyone can rest and recover (BCW: ''Environmental/Social Planning'') (Nettleton et al., 2012).

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Declaration of interest

JN has separately received project grant support from Mundipharma for a qualitative exploration of patient perspectives on medication formulation options. JS is a clinician and researcher in the university and NHS and has also worked with several pharmaceutical companies to seek to identify new or improved medications, but they do not have a relationship to the study and findings reported here. This has included research grant support and consultancy payments to JS's employer (King's College London) and travelling and/or accommodation and/or conference expenses (including, past 3 years, from Martindale, Indivior, MundiPharma, Braeburn). For updated information see John Strang's departmental webpage at http://www.kcl.ac.uk/ioppn/depts/addictions/people/hod.aspx. JM declares grant funding at the IoPPN and SLaM MHFT from NIHR (HTA) for a trial of extended-release naltrexone and honoraria from Merck Serono (2013, 2015; clinical oncology medicine), Indivior (via PCM Scientific) as faculty member (2012–2013), co-chair (2015–2016) and chair (2017) for the Improving Outcomes in Treatment of Opioid Dependence conference, and Martindale as facilitator for a scientific advisory meeting (2017). The authors declare no other conflicts of interest.

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