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ORIGINAL ARTICLE

User perceptions of the benefits and harms of hallucinogenic drug use: A web-based questionnaire study

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Abstract
This study used a web-based questionnaire to investigate user perceptions of the benefits and harms of hallucinogenic drug use. Over 600 forms were submitted. Users were asked to comment on the acute and prolonged effects of different drugs and to provide more specific information on how particular drugs have harmed and/or helped them. Subjects reported relatively less harm associated with the classic hallucinogens, LSD and psilocybin, than other drugs specifically focused on in the questionnaire (MDMA, cannabis, ketamine and alcohol). A wide-range of benefits was reported, including: help with mood disorders, addictions and migraine as well as more general long-term improvements in wellbeing. Symptoms of hallucinogen persisting perceptual disorder were reported by a number of subjects and these were most closely associated with use of LSD; however, few users regarded these effects as troubling. Eighty-one per cent of users reported having had a 'spiritual experience' on a hallucinogenic drug and over 90% considered 'access to the unconscious mind' to be a specific property of the classic hallucinogens. With caution, these findings support recent calls for a systematic investigation of the therapeutic potential of the classic hallucinogens and highlight the scope for empirical investigations of spiritual and psychodynamic phenomena.

Keywords: *Hallucinogens, psychedelics, LSD, psilocybin.*

Introduction

This study used a web-based questionnaire targeted at recreational drug users to collect information on the perceived benefits and harms of drug use, with a particular focus on hallucinogenic or 'psychedelic' drugs. Questions were designed to address users' perceptions of benefits and harms associated with their own drug use what these specific effects are, and which drugs they consider to be the most beneficial and harmful. Specific enquiries were made about use of LSD, psilocybin, ketamine, MDMA, cannabis and alcohol. Early (Sandison, 1954) and recent work (Griffiths, 2008) has indicated that controlled administration of the classic hallucinogens, LSD and psilocybin, in supportive settings can

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facilitate meaningful experiences of lasting benefit. However, there are also reports of acute and prolonged adverse responses to these drugs (Cohen & Ditman, 1962; Griffiths et al., 2006). This study sought to assess the relative prevalence of perceived positive and negative responses to hallucinogenic drug use, using ketamine, MDMA, cannabis and alcohol as comparators. Given the historical use of LSD and psilocybin as adjuncts to psychoanalytic psychotherapy in the 1950s and 1960s (Abramson, 1967; Grinspoon & Bakalar, 1979) we also asked subjects to comment on each drug's ability to facilitate the emergence of 'repressed' memory and emotion. We also sought to address uncertainties regarding the prevalence of flashback phenomena and/or 'hallucinogen persisting perceptual disorder' (HPPD; Halpern & Pope, 2003).

Methods

The questionnaire was made available online for approximately 6 weeks. It was advertised on the following websites: www.bluelight.org, www.maps.org, www.shroomery.org, www.hijack.bristol.co.uk, www.breakbeat.co.uk, www.efestivals.co.uk. The specific focus of these websites include:

- promoting education about all aspects of recreational drug use (bluelight.org);
- promoting education about use of hallucinogenic mushrooms (shroomery.org);
- assisting research into therapeutic applications of MDMA, hallucinogenic drugs, and cannabis (maps.org);
- discussing youth culture, dance music and music festivals (hijack.bristol.co.uk, breakbeat.co.uk, efestivals.co.uk).

Participants were directed to the questionnaire through links on the above websites. The questionnaire was advertised as a 'recreational drug questionnaire'. Enquiries were made into advertising on a government-funded drug-help website but these were unsuccessful. Submissions were sent directly to a password protected email address. Forms were excluded from analysis if they contained no entries, if they were only partially complete or if they were duplicated versions of already submitted forms. A total of eight forms were excluded from analysis. Since the data is qualitative and descriptive we chose not to perform any statistical analyses. The study was approved by the University of Bristol, Faculty of Medicine Ethics Committee.

Results

Demographics

Six-hundred-and-twenty-six completed forms were submitted. Forty-four per cent of participants were American, 30% British, 10% non-British Europeans, 6% Canadians, 5% Australians and 5% were either of another nationality or did not disclose this information. Approximately 25% of participants said they had heard about the questionnaire through the website www.bluelight.org and 25% had heard about it through MAPS. Others reported hearing about it through friends or the other websites listed. The mean age of participants was 26 (±11) and 15% were female. All participants reported having used alcohol (n = 626), 99% cannabis (n = 620), 83% MDMA (n = 517), 80% psilocybin (n = 503), 74% LSD (n = 463), and 40% ketamine (n = 247). Of the total sample of 626

16.9% reported having been diagnosed with depression at some point in their life (including bipolar disorder), 6.5% reported an anxiety disorder, 1% schizophrenia, 0.3% Asperger, 4.1% attention deficit disorder and/or attention deficit hyperactivity disorder, 1.1% obsessive compulsive disorder (OCD), 1% post-traumatic stress disorder (PTSD), 0.8% an addiction disorder and 0.8% insomnia.

Perceived drug effects

Long-term wellbeing. Of the total sample of subjects who reported having used LSD ('LSD users'), 67% reported that LSD had had a positive (35%) or a very positive (32%) long-term effect on their sense of wellbeing. Of all the drugs used, LSD was reported to have had the most positive effect on wellbeing, closely followed by psilocybin; 60% of psilocybin users reported that psilocybin had had a positive (32%) or a very positive (27%) effect on their sense of wellbeing. Alcohol was reported to have had the least positive effects on wellbeing; only 6% of users reported that alcohol had had a positive effect and 0.3% a very positive effect on wellbeing. Alcohol and cannabis were reported to have had the most negative effect on wellbeing—19% of alcohol users reported that alcohol had had a negative (16%) or very negative (3%) effect on their sense of wellbeing, and 18% of cannabis users reported that cannabis had had a negative (16%) or a very negative (2%) effect on their sense of wellbeing. LSD and psilocybin were reported to have had the least negative effect on wellbeing; only 2% of LSD users reported that LSD had had a negative effect on wellbeing and 3% of psilocybin users reported that psilocybin had had a negative (2.4%) or a very negative (0.2%) effect on their wellbeing (see Fig. 1).

Physical or mental health benefits. Of the total sample of LSD users, 24% reported that their use of LSD had 'definitely' helped with a physical or mental health problem. Psilocybin

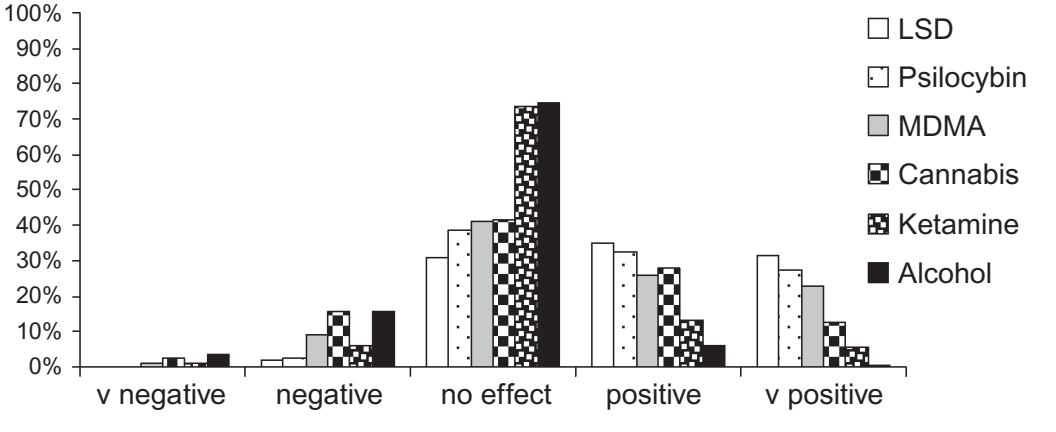

Figure 1. For each drug they had taken, subjects were asked whether they perceived it to have helped them with any physical or mental health problems. Five options were presented as radio buttons and only one could be selected: 'yes, it has had a very negative effect', 'yes, it has had a negative effect', 'no it has not really affected my sense of wellbeing', 'yes it has had a positive effect' and 'yes, it has had a very positive effect'. LSD and psilocybin were considered to have the most positive and least negative long-term effect on wellbeing.

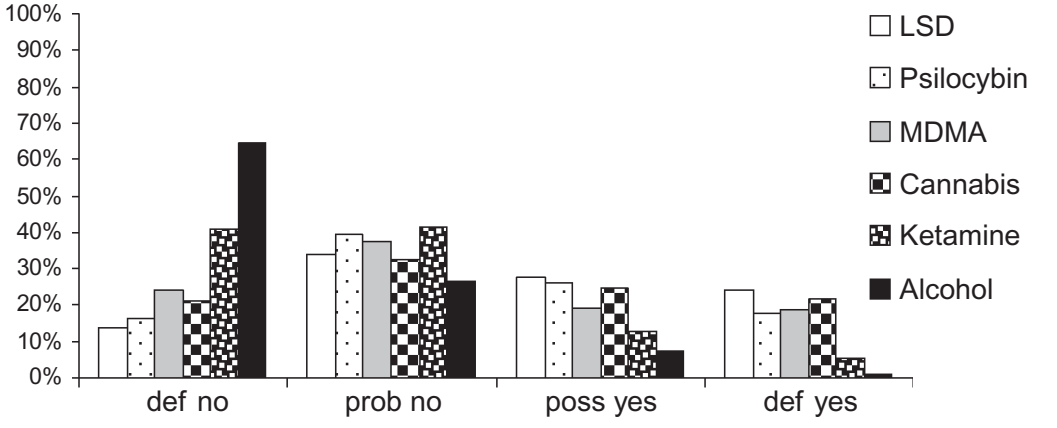

Figure 2. For each drug they had taken, subjects were asked to speculate whether it had ever helped them with any physical or mental health problems. Four options were presented as radio buttons and only one could be selected: 'definitely no', 'probably no', 'possibly yes', 'definitely yes'.

(18%), MDMA (19%), and cannabis (21%) were also said to have definitely helped. In contrast, only 1% of alcohol users believed that alcohol had definitely helped them (Fig. 2).

Physical or mental health harms. When asked whether their use of each drug had caused or made worse any physical or health problems, 41% of alcohol users reported that their use of alcohol had 'probably' (21%) or 'definitely' (19%) caused or made worse a physical or mental health problem. Forty-three per cent of cannabis users reported their use of cannabis had 'probably' (30%) or 'definitely' (12%) caused or made worse a physical or mental health problem. The drug least associated with causing or making worse a physical or mental health problem was psilocybin; 13% of psilocybin users reported that use of psilocybin had 'probably' (11%) or 'definitely' (2%) caused or made worse a physical or mental health problem (Fig. 3).

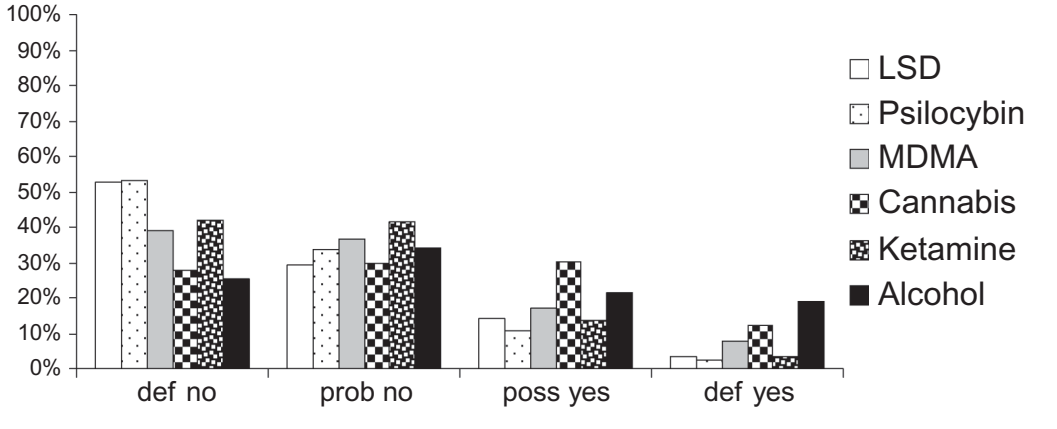

Figure 3. For each drug they had taken, subjects were asked whether they perceived it to have caused or made worse a physical or mental health problem. Four options were presented as radio buttons and subjects could select only one: 'definitely no', 'probably no', 'possibly yes', and 'definitely yes'. Alcohol and cannabis were most strongly associated with causing or making worse physical or mental health problems and LSD and psilocybin were considered the least harmful in this respect.

Relative seriousness of negative effects. Subjects who reported having taken a particular drug were also asked to rate the seriousness of the negative effects associated with its use on a scale of 0–10 (0 being 'not serious at all'; Table I). Alcohol was rated as having the most serious negative effects (mean rating 7.5) and cannabis the least (mean rating 3.1). [Regrettably, the results for psilocybin (mean rating 2.4) were invalidated by an inconsistency in the wording of the question for this particular drug (it was asked '. . . rate how serious you think the "long-term negative effects" of psilocybin are, rather than just 'negative effects'.]

Relative therapeutic potential. Subjects who reported having taken a particular drug were also asked to rate its potential for treating mental illness. LSD (mean rating 6.9), psilocybin (mean rating 6.5), and MDMA (mean rating 6.6) were rated as having the most therapeutic potential and alcohol (mean rating 0.6) was rated as having the least therapeutic potential (Table I).

Relative liking of short-term drug effects. Subjects who reported having taken a particular drug were also asked to rate how much they liked its short-term effects. All drugs were rated over 5 indicating that they were all liked but LSD was rated as the most liked (8.3) and alcohol the least (5.5; Table I).

Questions of relevance to psychoanalytic theory. Subjects who reported having taken a particular drug were also asked to report whether they felt it allowed them to access aspects of their 'unconscious mind'. Despite the abstract nature of this question, 94% of LSD users and 93% of psilocybin users answered 'probably yes' (32% LSD, 33% psilocybin) or 'definitely yes' (62% LSD, 59% psilocybin). In contrast, 84% of alcohol users answered 'probably no' (30%) or 'definitely no' (54%) to this question (Fig. 4).

Subjects who reported having taken all the drugs focused on in this questionnaire (i.e. LSD, psilocybin, MDMA, ketamine, cannabis and alcohol, referred to here on as 'the comprehensive sample', $n = 174$) were asked to select the drug they considered most likely to facilitate access the unconscious mind. LSD was selected most often (43%), followed by psilocybin (14%), ketamine (8%), MDMA (6%), cannabis (1%), none-of-them (1%), and a (0%). Of the remaining 27%, 15% selected dimethyltryptamine (DMT)—alcohol tryptamine hallucinogen pharmacologically-related to LSD and psilocybin, 3% selected the novel hallucinogen salvia divinorum, 0.3% selected phencyclidine—a dissociative

Table I. Displayed are mean values 0–10 ± SE. (Row 1) For each drug they had taken, subjects were asked to rate on a scale of 0–10 (0 being 'not serious at all) how serious they perceived its negative effects to be. Only one number could be selected from a series of eleven radio buttons (0–10).* The results for psilocybin (mean rating 2.4) are invalid as there was an inconsistency in the wording of the question for this specific drug (see above). (Row 2) For each drug they had taken, subjects were asked to rate on a scale of 0–10 (0 being 'no potential at all) how much potential for treating mental illness they perceived it to have. Only one number could be selected from a series of eleven radio buttons (0–10). (Row 3) For each drug they had taken, subjects were asked to rate on a scale of 0–10 (0 being 'I hate its short-term effects') how much they liked its short-term effects. Only one number could be selected from a series of eleven radio buttons (0–10)

	LSD	Psilocybin	MDMA	Cannabis	Ketamine	Alcohol
Perceived seriousness of negative effects	3.9 ± 0.1	2.4* ± 0.1	4.4 ± 0.1	3.1 ± 0.1	4.8 ± 0.2	7.5 ± 0.1
Perceived therapeutic potential	6.9 ± 0.1	6.5 ± 0.1	6.6 ± 0.1	4.9 ± 0.1	3.7 ± 0.2	0.6 ± 0.1
Liking of short-term effects	8.3 ± 0.1	7.8 ± 0.1	8.2 ± 0.1	7.2 ± 0.1	6.5 ± 0.2	5.5 ± 0.1

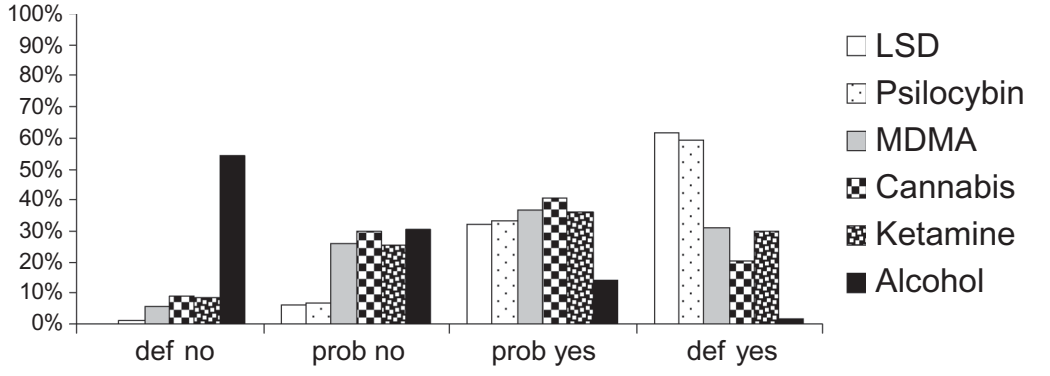

Figure 4. For each drug they had taken, subjects were asked to give an opinion on whether they thought it allowed access to the unconscious mind. Four options were presented as radio buttons and only one could be selected: 'definitely no', 'probably no', probably yes' and 'definitely yes'. Subjects were much more likely to attribute this property to LSD and psilocybin than any of the other drugs, particularly alcohol.

anaesthetic pharmacologically related to ketamine and 9% chose not to specify a particular drug (i.e. choosing the option 'none more than any other' or 'one not listed'; see Table II).

Subject in the comprehensive sample were asked whether they had ever experienced vivid recollections of childhood memories while under the effects of hallucinogens. 22% answered 'definitely no', 27% answered 'probably no', 24% answered 'probably yes', and 27% answered 'definitely yes'. Of those who answered 'definitely yes' (n = 47), 30% reported that they were most likely to experience childhood recollections on LSD, followed by MDMA (23%), ketamine (11%), psilocybin (6%), cannabis (6%) and alcohol (0%). The remaining 24% either selected another drug (e.g. 11% DMT, 4% salvia) or chose not to specify one (9%).

Subjects in the comprehensive sample were asked whether they had ever felt like they were in a 'waking dream' while under the effects of a hallucinogenic drug: 6% answered 'definitely no', 16% answered 'probably no', 21% answered 'probably yes' and 55% answered 'definitely yes'. Of those who answered 'definitely yes' (n = 97), 28% reported that ketamine was the most 'dream-like' in its effects, followed by LSD (22%), psilocybin (15%), MDMA (5%), cannabis (1%) and alcohol (0%). The remaining 29% either selected another drug (e.g. DMT 12%; salvia 10%) or chose not to specify one (7%).

Subjects in the comprehensive sample were also asked whether they had ever experienced any unusual sexual fantasies and/or impulses while under the effects of a hallucinogenic drug: 10% answered 'definitely no', 23% answered 'probably no', 29% answered 'probably yes' and 37% answered 'definitely yes'. Of those who answered 'definitely yes' (n = 65), 45% reported that they were most likely to experience unusual sexual fantasies and/or impulses on while on MDMA, followed by LSD (14%), cannabis (5%), psilocybin (3%), ketamine (3%) and alcohol (3%). The remaining 26% either selected another drug (e.g. DMT 5%, salvia 2%) or chose not to specify one (19%).

Questions specific to the study of mystical or spiritual experiences. Subjects in the comprehensive sample were asked whether they had ever had a 'spiritual experience' while under the effects of a hallucinogenic drug: 9% answered 'definitely no', 11% answered 'probably no', 18% answered 'probably yes' and 63% answered 'definitely yes'. Of those who answered

Table II. (Row 1) Subjects in the comprehensive sample (n = 174) were asked to state which drug they considered most capable of facilitating access to the unconscious mind. Subjects chose one from the following 12 options: LSD, psilocybin, ketamine, PCP/angel dust, MDMA, salvia, DMT and ayahuasca, cannabis, alcohol, one not listed, none more than any other, none of them. (Row 2) Subjects in the comprehensive sample were asked to state which drug they considered most likely to engender unusual sexual impulses and/or fantasies. The same 12 options listed above were given as radio buttons and subjects could select only one. (Row 3) Subjects in the comprehensive sample who answered 'definitely yes' to the question 'Have you ever experienced vivid recollections of childhood memories while under the effects of a hallucinogenic drug?' (n = 47, 27%) were asked to select the drug they considered most capable of producing this phenomenon. The same 12 options listed above were given as radio buttons and subjects could select only one. (Row 4) Subjects in the comprehensive sample who answered 'definitely yes' to the question 'Have you ever felt like you were in a waking dream while under the effects of a hallucinogenic drug?' (n = 97, 55%) were asked to select the drug they considered to have the most dreamlike effects. The same 12 options listed above were given as radio buttons and subjects could select only one. (Row 5) Subjects in the comprehensive sample were asked to state which drug they considered most likely to engender spiritual experiences. The same 12 options listed above were given as radio buttons and subjects could select only one. (Row 6) Of the comprehensive sample, 70 subjects (40% of the sample) answered 'yes, moderately' or 'yes, very much' to the question 'Have you ever noticed any long-term changes to their vision or hearing since taking a psychedelic drug'. These 70 subjects were asked to select the drug they considered most responsible for the changes. The same 12 options listed above were given as radio buttons and subjects could select only one. (Row 7) Of the comprehensive sample, 38 subjects (22% of the sample) selected 'definitely yes' to the question 'have you ever experienced a 'flashback', i.e. the feeling that you are re-experiencing a psychedelic drug experience without actually having taken anything?' These 38 subjects were asked to state which drug they considered most responsible for the flashback/s. The same twelve options listed above were given as radio buttons and subjects could select only one

	LSD	Psilocybin	MDMA	Cannabis	Ketamine	Alcohol	None	Others
Best facilitates access to the 'unconscious mind'	43%	14%	6%	1%	8%	0%	1%	27%
Most induces unusual sexual fantasies	23%	3%	45%	5%	3%	3%	0%	26%
Best facilitates childhood recollections	30%	6%	23%	6%	11%	0%	NA	24%
Most 'dream-like' subjective effects	22%	15%	5%	1%	28%	0%	NA	29%
Best facilitates spiritual experiences	29%	25%	4%	2%	5%	0%	0%	32%
Most responsible for persistent perceptual changes	39%	11%	9%	9%	4%	1%	NA	28%
Most responsible for flashbacks	55%	22%	8%	0%	5%	0%	NA	11%

'definitely yes' (n = 109), 29% reported that they are most likely to have a spiritual experience on LSD, followed by psilocybin (25%), ketamine (5%), MDMA (4%), cannabis (2%) and alcohol (0%). The remaining 32% either selected another drug (e.g. DMT 19%, salvia 6%) or chose not to specify one (7%).

Flashbacks and HPPD. Subjects in the comprehensive sample were asked whether they had ever noticed any long-term changes to their vision or hearing since taking a 'psychedelic' drug (e.g. trails or patterns in their visual field)—22% answered 'definitely no', 38% answered that there had been 'no noticeable change', 34% answered 'yes moderately' and 6% answered 'yes, very much' (Fig. 5). Of those who answered either 'yes moderately' or 'yes, very much' (n = 70), 73% reported that the changes did not bother them at all, 24% reported that they would rather not have them but could live with them and 3% reported 'they drive me mad'. Thus, of the all the subjects in the comprehensive sample, 10%

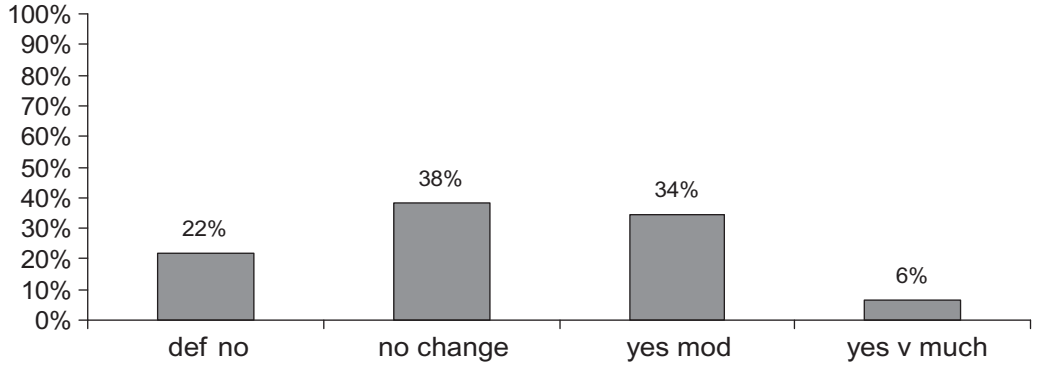

Figure 5. Subjects in the comprehensive sample (n = 174) were asked whether they had noticed any long-term changes to their vision or hearing since taking a 'psychedelic' drug. Four options were presented as radio buttons and subjects could select only one: 'yes, very much so', 'yes, moderately so', 'no noticeable change or barely noticeable' and 'definitely not'. 70 subjects, 40% of the sample, selected 'yes, moderately so' (34%) or 'yes, very much so' (6%).

reported long-term changes to their vision or hearing, which they would 'rather not have but could live with' and 1% reported changes that 'drove them mad'. When the sample of 70 subjects who reported some change were asked which drug they felt was most responsible for the changes, 39% answered LSD, followed by 11% psilocybin, 9% MDMA and cannabis, 4% ketamine and 1% alcohol. Of the remaining 28%, 6% selected another drug (3% DMT, 3% salvia) and 22% chose not to specify one.

Subjects in the comprehensive sample were also asked whether they had ever experienced a 'flashback', defined as 'the feeling that you are re-experiencing a psychedelic drug experience without actually having taken anything': 22% of subjects answered 'definitely yes' to this question (Fig. 6). Of those who answered 'definitely yes' (n = 38), 2% reported that the experience had a 'very negative' effect on them, 8% reported that it had a 'negative' effect on them, 47% reported that it had not really affected them at all, 21% reported that it had a 'positive' effect on them and 18% reported that it had a 'very positive' effect on them. Thus, of the total sample of subjects who had used all the drugs covered in this study (n = 174), only 3% reported that they had experienced a flashback which had a negative (2%) or a very negative (1%) effect on them. When those 38 subjects who were definite that they had experienced a flashback were asked which drug they considered most responsible for the phenomenon, 55% answered LSD, followed by psilocybin (22%), MDMA (8%), ketamine (5%) cannabis (0%), and alcohol (0%). Of the remaining 11%, 3% selected another drug (e.g. salvia 3%) and 8% chose not to specify one.

Subjects' comments

Subjects were given opportunities to provide comments about different aspects of their drug use. The following section provides summaries of these, categorized by drug and theme.

Perceived health benefits of drug use: LSD. One-hundred-and-ninety-three subjects commented on the health benefits of LSD, 42% of the total sample of LSD users. Twenty-three reported a belief that LSD had helped alleviate depressive symptoms, 20 claimed it had

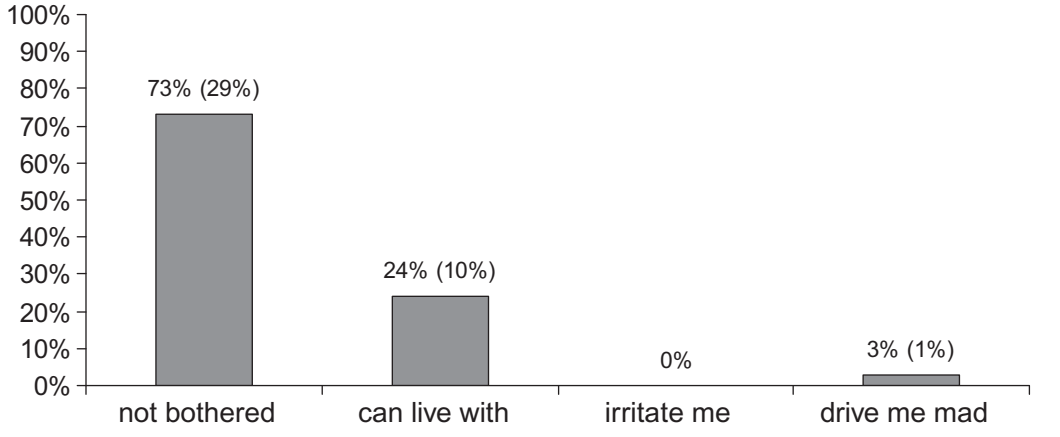

Figure 6. The 70 subjects who reported some persistent perceptual changes were asked to say how this affected their everyday life. Four options were presented as radio buttons and subjects could select only one: 'they drive me mad', 'they irritate me', 'I'd rather not have them but I can live with them' and 'they don't bother me at all'. 89% of the total comprehensive sample (n = 174) either reported that they had not experienced any changes (60%) or if they had, they were not bothered by them (29%), but 10% reported that they'd rather not have the changes but could live with them and 1% (two subjects) reported that the changes drive them mad.

helped with anxiety, eight claimed it had helped with an addiction, three claimed it had helped with migraines and headaches, two claimed it had lessened their paranoia and two claimed it had helped them with an eating disorder. Other benefits mentioned included improved insight, perspective, self-understanding and acceptance, resolution of existential anxieties, help with mourning and a reduced fear of death, improved optimism, self-esteem and an increased sense of spirituality.

> LSD was instrumental in allowing me to begin recovering from a lifetime of depression. (Male, aged 19, USA)

Psilocybin. One-hundred-and-seventy-six subjects commented on the health benefits of psilocybin, 35% of the total sample of psilocybin users. Twenty-four subjects reported a belief that psilocybin had helped alleviate depressive symptoms, 14 reported that it had helped with anxiety, six claimed it had helped with an addiction and five claimed it had helped with headaches and migraine. Similar to LSD, the more general benefits included improved insight, perspective, wellbeing, optimism, self-acceptance and self-realisation, a sense of inner-peace and wellbeing, a greater appreciation of nature and an increased sense of spirituality.

> After my first 'trip', I noticed that the depression I have suffered from my whole life was greatly abated. (Male, aged 19, USA)

MDMA. One-hundred-and-sixty-four subjects commented on the health benefits of MDMA, 32% of the total sample of MDMA users. Twenty-one subjects reported that MDMA had helped alleviate depressive symptoms, 16 claimed it had helped with their anxiety and three claimed it had helped with symptoms of PTSD. A large number of subjects mentioned MDMA's capacity to facilitate feelings of empathy and how this had

had a positive impact on interpersonal relationships. Other benefits included reduced shyness, increased social confidence, and an increased sense of optimism.

> The first time I took MDMA was when I was suffering from social anxiety (or at least had been so diagnosed by my GP). I burst into tears and told the friends who were around me about my anxiety and the worries stemming from it. While on the drug I felt an incredibly strong sense of connection to my friends, and it seemed as though this was what had been missing from my relationships with them throughout my social anxiety. This sense carried through to the next day and week, and even beyond. (Female, aged 22, UK)

Cannabis. Two-hundred-and-forty-nine subjects commented on the health benefits of cannabis, 40% of the total sample of cannabis users. Fifty-seven reported that that cannabis was an effective pain reliever and/or antiemetic, 40 claimed it had helped alleviate depressive symptoms, 30 claimed it had helped with anxiety, and 11 claimed it helped with insomnia. A large number of subjects praised the drugs' ability to combat stress, control anger and aid relaxation.

> Cannabis eases pain and counters nausea better than over the counter medication. (Male, aged 17, Canada)

Ketamine. Thirty-five subjects commented on the health benefits of ketamine use, 14% of the total sample of ketamine users. Nine subjects claimed it had provided short-term relief for their depression, five claimed it provided short-term pain relief, two claimed it had helped with anxiety and two claimed it had helped with an addiction. Other benefits included improved insight and a greater sense of spiritual awareness.

> I find it to have a short term antidepressant effect and provides an all round sense of well being. (Male, aged 33, UK)

Alcohol. Forty-nine subjects commented on the health benefits of alcohol use, 8% of the total sample of alcohol users. Sixteen subjects reported that alcohol helped with anxiety, but often only when acutely intoxicated, six subjects claimed it provided temporary pain relief, two subjects claimed it had helped with their depression and two subjects claimed it helped their insomnia. Subjects often mentioned alcohol's ability to ease social anxiety, improve social confidence, and reduce social reserve. Some subjects also reported that alcohol provided a means of forgetting and escape from emotional problems.

> Alcohol helps me with social anxiety. It is a good social lubricant. (Male, aged 48, USA)

Perceived health risks associated with drug use: LSD. Sixty-six subjects commented on the health risks of LSD use, 14% of the total sample of LSD users. Nine subjects reported increased anxiety post-LSD use, six subjects reported persistent psychotic symptoms including paranoia (four subjects) hallucinosis (one subjects) and mania (one subject), six subjects reported symptoms of HPPD such as persistent visual distortion, five subjects believed LSD had contributed to their depression, two subjects reported a worsening of OCD symptoms, and six subjects reported having been generally negatively affected by a difficult drug experience.

I hear stuff that isn't really there, like young girls crying. (Male, aged 21, UK)

Psilocybin. Fifty-nine subjects commented on the health risks of psilocybin use, 12% of the total sample of psilocybin users. Eight subjects reported increased anxiety, including panic attacks (four subjects); eight subjects reported persistent psychotic symptoms including paranoia (three subjects), confusion (two subjects), derealization (two subjects), disconnection from reality (one subject), and mania (one subject). Five subjects reported worsened depression, five subjects reported gastrointestinal problems associated with the ingestion of mushrooms, four subjects reported symptoms of HPPD, and five subjects reported having been generally negatively affected by a difficult drug experience.

Taking psilocybin too much (every week for months) caused me to become disconnected from reality. (Male, aged 22, USA)

MDMA. One-hundred-and-nine subjects commented on the health risks of MDMA use, 21% of the total sample of MDMA users. Fifty-seven subjects believed their use of MDMA had caused or contributed to depression (this was often reported to be short-lived, but persistent depression was also reported), 18 subjects believed it had caused or contributed to short-term and/or persistent anxiety, 12 subjects reported noticeable cognitive impairments, eight subjects reported increased paranoia after use, six subjects reported persistent insomnia, three subjects reported weight loss, and two subjects reported symptoms of HPPD.

When I was using MDMA on a regular basis I suffered from panic attacks, anxiety and low mood. I now feel this was related to my use of MDMA. (Female, aged 30, UK)

Cannabis. Two-hundred-and-thirty-eight subjects commented on the health risks of cannabis use, 38% of the total sample of cannabis users. Sixty-four subjects reported increased short- and long-term anxiety associated with cannabis use, 56 reported increased short-term and long-term paranoia, 38 reported physical health problems associated with smoking, 36 subjects reported a worsening of depression, 33 reported impaired short-term memory and ability to concentrate, 24 subjects reported reduced motivation, increased apathy and lethargy, three subjects reported dependency, and two subjects reported a worsening of HPPD symptoms.

Cannabis made me depressed and brought out an anxiety disorder. (Male, aged 20, USA)

Ketamine. Thirty-two subjects commented on the health risks associated with ketamine use, 13% of the total sample of ketamine users. Eight subjects mentioned physical ailments, such as urinary dysfunction, six subjects believed it had worsened their depression, six subjects reported noticeable cognitive impairments, four subjects reported dependency, three subjects reported symptoms of HPPD, and one subject reported persistent paranoia.

Ketamine has left me with body pains after binges. (Male, aged 21, Canada)

Alcohol. One-hundred-and-eighty-eight subjects reported health risks associated with alcohol use, 30% of the total sample of 626 alcohol users. Fifty-six subjects reported

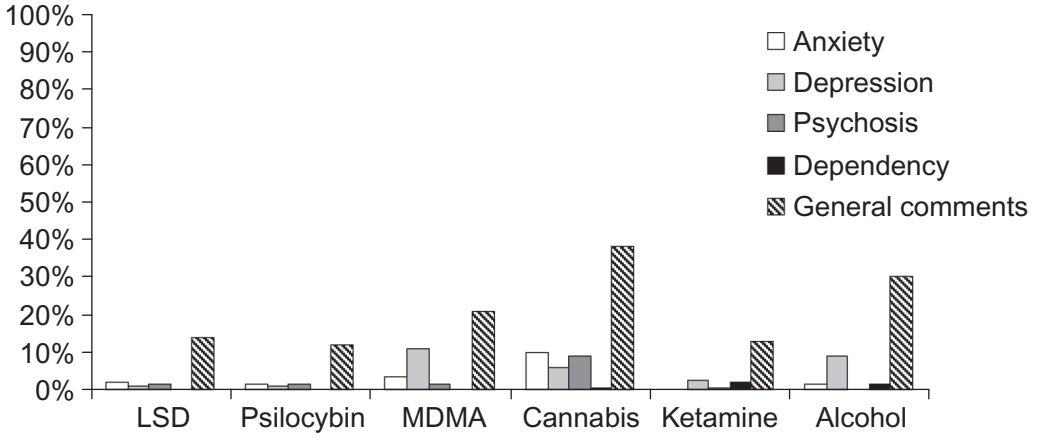

Figure 7. For each drug they had taken, subjects were asked first to state whether the drug had caused or made worse a physical or mental health problem (see Fig. 3) and then to comment on *how* it had negatively affected them. For each drug, all the comments were totalled and then given as a percentage of the total number of users of that drug (e.g. 188 general comments on the negative effects of alcohol, 30% of the total 626 alcohol users). For each drug, we also totalled comments which specifically mentioned certain psychiatric conditions and this was also given as a percentage of the total number of users of that drug (e.g. 56 alcohol users specifically mentioned depressive symptoms associated with alcohol use, 8.9% of the total 626 alcohol users).

short-term and long-term depression that they associated with their alcohol use, 38 subjects reported physical health problems including acute sickness, drunken injuries, liver problems, and general poor health. Nine subjects reported increased anxiety, particularly when hung-over, eight subjects reported dependency, and seven subjects reported weight gain, five reported acute memory loss and possible cognitive decline, and one subject reported mania and paranoia associated with intoxication (see Fig. 7).

> Alcohol increased a negative depressive state I was in and facilitated my attempted suicide. (Male, aged 71, USA)

Discussion

The results of this questionnaire indicate some interesting patterns, which were not wholly anticipated. Before addressing these, it is important to issue an early caveat. A large proportion of the total sample reported becoming aware of the questionnaire through websites that take a relatively favourable view of drug use. Since we intended to target the drug using population, it was perhaps inevitable that our sample would contain individuals with positive opinions on drug use. We had tried to contact websites taking a more negative stance, but our requests to have the questionnaire made available on these sites were unsuccessful. The results of this study should therefore be considered biased towards drug users with positive opinions on drug use. However, since our sample reported experience with a range of different drugs, their opinions might be considered particularly well-informed.

The most compelling pattern to emerge from the results was the positive representation of the classic hallucinogens, LSD, and psilocybin. Overall, LSD and psilocybin were

regarded as the having the positive impact on wellbeing, and the least harms in terms of physical and mental health. Often cited dangers of hallucinogenic drug use include prolonged psychosis, injurious behaviours under intoxication, persistent perceptual changes, and 'flashback' phenomena (Cohen & Ditman, 1963; Novak, 1998; Johnson, Richards, & Griffiths, 2008). With regard to the latter, when subjects were invited to report *how* they had been negatively affected by their use of LSD and psilocybin, 1.3% (six of 463) of LSD users, and 0.8% (four of 503) psilocybin users reported symptoms of HPPD, and no subjects mentioned flashbacks. If subjects were asked more directly about persistent perceptual changes and flashbacks, the prevalence appeared much higher, e.g. 10% of the comprehensive sample reported that they had noticed some long-term changes to their perception and that, although they could live with these changes, they would rather not have them. It should be emphasized that these percentages do not refer to clinically significant HPPD or, indeed, diagnoses. In hindsight, it would have been better to have provided the DSM-IV definition of HPPD (American Psychiatric Association, 1994) and asked users whether they considered themselves to meet the criteria. Thus, the 1.3% of LSD users and 0.8% of psilocybin users who reported symptoms of HPPD, unprompted, probably best reflects the prevalence of clinically significant HPPD among recreational users of the classic hallucinogens. This said, however, the finding that 40% of users reported some change, even if this change was perceived as unimportant by the majority of users (73%) is still worth considering, and the tendency of users to associate the changes with LSD, rather than psilocybin is also interesting.

In contrast to alcohol, there were no reported cases of injuries associated with acute intoxication with LSD or psilocybin. With regards prolonged psychosis, 1.3% (six of 463) of LSD users and 1.6% (eight of 503) of psilocybin users reported persistent psychotic symptoms including paranoia, hallucinosis, and derealization. These percentages are higher than those of Cohen (1960) who found rates of 0.08% (one in 1200) in a non-patient sample and 0.2% (eight in 5000) in a patient sample. Cohen predicted that the risk of prolonged psychosis would be higher in uncontrolled settings and this is supported by our data. It is possible that the rates of prolonged psychosis (and HPPD) indicated by our data under represent the actual risks, since individuals suffering from major psychoses and HPPD are less likely to be visiting the kind of websites on which the questionnaire was advertised. However, we should also bear in mind that our data reflect self-reported symptoms and not diagnoses; moreover, when viewed in relative terms, the rates of reported prolonged psychotic symptoms associated with LSD and psilocybin were much lower than those associated with cannabis (9%), and about equal to that associated with MDMA (1.5%). In addition, the percentage of users reporting hallucinogen-related induction or exacerbation of anxiety (1.9% LSD, 1.6% psilocybin) and depression (1.1% LSD, 1% psilocybin) were also much lower than those associated with cannabis (anxiety 10%, depression 6%), MDMA (anxiety 3%, depression 11%), and alcohol (anxiety 1.4%, depression 9%). It is possible that since LSD and psilocybin are typically used much less often than cannabis and alcohol, this reduces the likelihood that users will attribute negative effects to their use, but we might equally consider the relatively infrequent use of LSD and psilocybin a relatively positive aspect of their use/abuse.

The responses to our questionnaire suggest that, when compared against cannabis and alcohol, the dangers of LSD, and psilocybin are relatively moderate. It is interesting to consider therefore why they are often regarded as particularly dangerous drugs. This perspective would be justified if there were good evidence that they promote dangerous behaviours or the induction and/or exacerbating of mental health problems, such as major

psychoses; however, as was suggested by the work in the 1950s and 60s (see Abramson, 1967 or Grinspoon & Bakalar, 1979 for reviews), more recent studies (e.g. Moreno, Wiegand, Taitano, & Delgado, 2006; Sewell, Halpern, & Pope, 2006; Griffiths et al. 2006, 2008; Johnson et al. 2008), and the present work, this does seem to be the case. With caution, our data support the case for reassessing the therapeutic potential of the classic hallucinogens (Sessa, 2005; Lancet Editorial, 2006). It is significant that 67% of the 463 LSD users and 60% of the 503 psilocybin users in our sample reported that their use of these drugs had had a long-term positive impact on their sense of wellbeing—higher than any of the other drugs. When subjects were invited to comment on *how* these drugs had helped them, a wide range of benefits were reported, from help with specific mental health issues, addictive behaviours, and migraines to more global improvements in wellbeing, e.g.

> Psilocybin made me very happy and I was not depressed at all for at least a week or two after I had taken it. (Male, aged 26, Denmark)
> Once seen through the lens of LSD I quit opiates after a 15 year habit. (Male, aged 46, UK)
> [LSD] helped me to stop my 2 year cocaine addiction. (Male, aged 20, US)
> [Psilocybin] helped me see the negative sides of alcohol use. I was heading down a road of becoming an alcoholic (4–5 days/week) but it caused me to see the bad things I was doing. (Male, aged 19, USA).
> Migraines stopped the same time I tried magic mushrooms and LSD. (Male, aged 19, Australia)
> LSD cured me of a most common disease: existential emptiness. (Male, aged 24, Brazil)

Tens of thousands of patients are estimated to have been treated with hallucinogen-assisted psychotherapy in the 1950s and 60s (Grinspoon & Bakalar, 1979). The dominant approach taken at this time was psychoanalytic (Grof, 1975). It was commented very early that LSD's capacity to facilitate introspection and insight might be utilized to shorten the psychotherapeutic process (Busch & Johnson, 1950). These early observations were supported by subsequent work (Sandison, 1954) and remained an integral part of the rationale behind the treatment programmes in the 1950s and 1960s (Grof, 1975). Our own enquiries into the putative psychodynamic properties of the classic hallucinogens revealed quite striking results: 94% of LSD users and 93% of psilocybin users reported that these drugs facilitated access to the unconscious mind, much higher than for any of the other drugs. These data indicate that, however abstract and ill-defined the concept, facilitated access to the unconscious mind may be a signature effect of the classic hallucinogens, e.g. 'Psilocybin helped bring forth personal issues that I had tried to repress and some others that I had never thought about before' (male, aged 18, USA). Furthermore, several of the subjects who claimed an improvement in their anxiety or depression after using these drugs reported that the benefits had come through the *insights* gained through the experience, e.g.

> Psilocybin has helped me confront the causes of my anxiety/depression. (Male, aged 21, Canadian)
> LSD was a spectacularly effective tool in allowing me to see what my anxiety was stemming from and how to deal with it. (Male, aged 16, USA)
> It's not that the LSD helped me, it helped me help myself. (Male, aged 18, USA)
> [Through psilocybin] I gained insight into myself and the world. It helped me solve issues because of this insight. (Male, aged 35, Netherlands)

Another property that appeared to be relatively specific to the classic hallucinogens was their ability to engender spiritual experiences: 81% of the comprehensive sample reported having had a spiritual experience on a hallucinogenic drug, and this effect was much more closely associated with LSD and psilocybin than any of the other drugs. As with the psychodynamic phenomena, the therapeutic models used in the 1950s and 1960s encouraged drug-induced spiritual experiences believing them to be an important part of the therapeutic process (e.g., Abramson, 1967; Mangini, 1998). Recent work with psilocybin has leant further support to the association between hallucinogens, spirituality and psychological benefits. For example, 67% of 36 hallucinogen-naïve subjects given a high dose of psilocybin maintained 14 months later that their experience was among the top five most spiritually significant experiences of their life and 64% reported that the experience had had a lasting positive impact on their sense of wellbeing (Griffiths et al., 2008). Interestingly, no subjects reported that their sense of wellbeing had been negatively affected by the experience—despite some reports of anxiety during the experience itself. The strong association between hallucinogenic drugs and psychodynamic and spiritual phenomena supported by our data highlights the need for systematic, neurobiologically-informed definitions of these ill-defined, but evidently important concepts.

It is difficult to get an accurate sense of the potential of LSD and psilocybin for treating mental illness from the subjective and qualitative data derived from our questionnaire. Conditions showing the strongest candidacy for research were depression, the anxiety disorders and substance dependency—consistent with the focus of treatment programmes in the 1950s and 1960s (see Abramson, 1967; Grinspoon & Bakalar, 1979; Mangini, 1998 for reviews). A number of LSD and psilocybin users also reported that the drugs offered effective relief for migraines—supporting recent work on cluster headaches (Sewell et al., 2006). Our data do not allow us to make specific inferences about the conditions most likely to benefit from treatment involving the classic hallucinogens or, indeed, whether the treatments would be effective These matters are dependent on such factors as the relative prevalence of the different disorders, their relative intractableness, the potential efficacy of the hallucinogens relative to current treatments and their relative potential for iatrogenesis. These factors will, however, only ever be addressed by a concerted and comprehensive programme of research.

There are several limitations to data derived through web-based questionnaires, e.g. selection bias, lack of experimental control, and the general subjective and qualitative nature of the data. We have already addressed the problem of selection bias, but it might also be added that, since the specific focus of the questionnaire was the classic hallucinogens, this attracted a sample that was particularly sympathetic to these compounds. However, apart from one website, which focused specifically on hallucinogenic mushrooms, none of the others could be considered biased towards the classic hallucinogens ahead of cannabis, MDMA, or ketamine. This is also supported by the relative prevalence of use of the different drugs (alcohol, cannabis, and MDMA were all used more often than psilocybin and LSD) and the relatively uniform 'liking' of the different drugs' short-term effects (with the possible exception of alcohol). Thus, there is no other convincing reason why these compounds should have been so favourably represented.

The findings of this study do not only have implications for research into the therapeutic potential of the classic hallucinogens; they also have implications for evidence-based assessments of drug-legislature, a matter of much recent controversy (Nutt, King, Saulsbury, & Blakemore, 2007; Murphy, 2007; McKeganey, 2009; Nutt 2009). The failure to include other major drugs of abuse such as tobacco, opiates, cocaine, and

amphetamines in our questionnaire is an oversight in this respect, and a follow-up study aimed at a larger and more comprehensive sample might yield more systematic and informative data. A recent initiative carried out by a group of drug and addiction specialists used a structured assessment scale to rate the relative dangers of different drugs of abuse (Nutt et al., 2007). The conclusion of two independent groups using this scale was that the current classification systems do not accurately reflect drugs' relative harms (Nutt et al., 2007). With regards the drugs focused on in our questionnaire, Nutt et al. considered alcohol to be the most dangerous; followed by ketamine, cannabis, LSD, and MDMA, respectively (psilocybin was not considered). Our data generally agree with these results; our sample perceived alcohol to be particularly harmful, but it also considered MDMA to be more harmful than the classic hallucinogens. Our results are somewhat consistent with those of another web-based questionnaire study, which asked drug users to rate the relative harms of 21 different drugs of abuse using the same structured assessment scale as Nutt et al. This study revealed a strong correlation between drug users' assessments' and those of the scientific experts in the Nutt et al. study. As in our own study, however, drug users rated the classic hallucinogens to be even lower on harm than the scientific experts' assessment and high on benefits (Morgan, Muettzelfeldt, & Curran, 2008).

Our discussion has so far only focused on the therapeutic potential of the classic hallucinogens; however, subjects also reported a variety of mental and physical health benefits from their use of cannabis, MDMA, and ketamine. A notable percentage of cannabis users' reported that cannabis had helped them with their depression (6.5%) and anxiety (4.8%), supporting recent suggestions that certain cannabinoids may offer relief for bipolar disorder and/or depression (Ashton, Moore, Gallagher, & Young, 2005). Several cannabis users also reported help with nausea and pain, supporting the long recognized connection between cannabis, and the alleviation of these and related symptoms (Croxford, 2003; Iversen, 2003). However, one should also note the relatively high percentage of users reporting a worsening of anxiety (10.3%), paranoia (9%), and depression (5.8%), and more insidious problems, such as lethargy and reclusiveness through cannabis use. A notable percentage of MDMA users reported that MDMA had helped with depression (4.1%) and anxiety (3.1%). Recent work has suggested that MDMA may facilitate psychotherapy for PTSD (Bouso, Doblin, Farré, Alcázar, & Gómez-Jarabo, 2008; Mithoefer, Mithoefer, & Wagner, 2008) and work is currently underway to expand this programme, with promising preliminary results (Mithoefer et al. 2008). Three subjects in our sample reported that MDMA had been effective in helping them with their PTSD. The potential benefits of MDMA for the treatment of mood disorders (Sessa & Nutt, 2007) was offset by a notable percentage of users reporting worsened anxiety (3.5%) and depression (11%) through their use of MDMA. While these effects were reported to be mostly transient, they do present a potential complication for clinical applications of MDMA. It should be noted, however, that recent evidence indicates that worsened mood associated with MDMA is more likely to be a temporary consequence of subacute serotonergic recovery than irrevocable serotonergic neurotoxicity (Selvaraj, Hoshi, Bhagwagar, Murthy, Hinz, Cowen, Curran, & Grasby, 2009). It should also be considered that the typical weekly use of large doses of MDMA is very different to the format suggested for clinical investigations (Doblin, 2002; Sessa & Nutt, 2007). Finally, although the reported benefits were less impressive, 3.6% of ketamine users reported that ketamine had helped with their depression. Recent evidence suggests that intravenous ketamine may be an effective treatment for intractable depression (Zarate, Singh, Carlson, Brutsche, Ameli, Luckenbaugh, Charney, & Manji, 2006; Liebrenz, Borgeat, Leisinger, & Stohler, 2007) and neuroimaging work has indicated a

possible mechanism by which the drug may elicit its antidepressant effects (Deakin, Lees, McKie, Hallak, Williams, & Dursun, 2008). The purported benefits of ketamine were offset by reports of adverse physical and psychological sequelae, such as urinary dysfunction, abdominal pains, worsened mood, cognitive impairments, and dependence, but again these are side-effects of regular recreational use and not necessarily clinical applications.

Conclusions

The results of this web-based questionnaire targeted at recreational drug users indicated that respondents perceive the classic hallucinogens, LSD, and psilocybin, to have relatively less potential for harm than alcohol, cannabis, MDMA, and ketamine, and a notable potential for benefit. Users of LSD and psilocybin reported a range of benefits including help with specific mental health problems, addictive behaviours, migraines, and more general improvements in wellbeing; supporting the case for reassessing their therapeutic potential. Areas for future research indicated by our data include the mood disorders, addiction, migraine, the neurobiology of psychodynamic and spiritual phenomena, and the neuropharmacology of the hallucinogens' putative therapeutic action. This study is limited by sample bias and the inherent unreliability of data derived from web-based questionnaires.

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Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

References

Abramson, H. A. (1967). *The Second International Conference on the Use of LSD in Psychotherapy*. New York: Bobbs-Merrill Co.

Ashton, C. H., Moore, P. B., Gallagher, P., & Young, A. H. (2005). Cannabinoids in bipolar affective disorder: a review and discussion of their therapeutic potential. *Journal of Psychopharmacology*, *19*(3), 293–300.

Bouso, J. C., Doblin, R., Farré, M., Alcázar, M. A., & Gómez-Jarabo, G. (2008). MDMA-assisted psychotherapy using low doses in a small sample of women with chronic posttraumatic stress disorder. *Journal of Psychoactive Drugs*, *40*(3), 225–236.

Busch, A. K., & Johnson, W. C. (1950). LSD 25 as an aid in psychotherapy; preliminary report of a new drug. *Diseases of the Nervous System*, *11*(8), 241–243.

Cohen, S., & Ditman, K. S. (1962). Complications associated with lysergic acid diethylamide (LSD-25). *Journal of the American Medical Association*, *181*, 161–182.

Croxford, J. L. (2003). Therapeutic potential of cannabinoids in CNS disease. *CNS Drugs*, *17*(3), 179–202.

Deakin, J. F., Lees, J., McKie, S., Hallak, J. E., Williams, S. R., & Dursun, S. M. (2008). Glutamate and the neural basis of the subjective effects of ketamine: a pharmaco-magnetic resonance imaging study. *Archives of General Psychiatry*, *65*(2), 154–164.

Doblin, R. (2002). A clinical plan for MDMA (Ecstasy) in the treatment of posttraumatic stress disorder (PTSD): partnering with the FDA. *Journal of Psychoactive Drugs*, *34*(2), 185–194.

Griffiths, R. R., Bigelow, G. E., & Henningfield, J. E. (1980). Similarities in animal and human drug-taking behaviour. *Advances in Substance Abuse*, *1*, 1–90.

Griffiths, R. R., Richards, W. A., McCann, U., & Jesse, R. (2006). Psilocybin can occasion mystical-type experiences having substantial and sustained personal meaning and spiritual significance. *Psychopharmacology (Berlin)*, *187*(3), 268–83; discussion 284–292.

Griffiths, R., Richards, W., Johnson, M., McCann, U., & Jesse, R. (2008). Mystical-type experiences occasioned by psilocybin mediate the attribution of personal meaning and spiritual significance 14 months later. *J Psychopharmacol*, 22, 621–32.

Grinspoon, L., & Bakalar, J. B. (1979). *Psychedelic Drugs Reconsidered*. New York: Basic Books.

Grof, S. (1975). Realms of the Human Unconscious. Observations From LSD Research. London. Souvenir Press.

Halpern, J. H., & Pope, H. G., Jr (2003). Hallucinogen persisting perception disorder: what do we know after 50 years? *Drug and Alcohol Dependence*, *69*(2), 109–119.

Iversen, L. (2003). Cannabis and the brain. *Brain*, *126*(6), 1252–1270.

Johnson, M., Richards, W., & Griffiths, R. (2008). Human hallucinogen research: guidelines for safety. *Journal of Psychopharmacology*, *22*(6), 603–620.

Lancet Editorial (2006). Reviving research into psychedelic drugs. *Lancet*, *367*(9518), 1214.

Liebrenz, M., Borgeat, A., Leisinger, R., & Stohler, R. (2007). Intravenous ketamine therapy in a patient with a treatment-resistant major depression. *Swiss Medical Weekly*, *137*(15–16), 234–236.

Mangini, M. (1998). Treatment of alcoholism using psychedelic drugs: a review of the program of research. *Journal of Psychoactive Drugs*, *30*(4), 381–418.

McKeganey, N. (2009). The classification of ecstasy is not a black-and-white issue. Retrieved January 15, 2009, from www.guardian.co.uk.

Mithoefer, M., Mithoefer, A., & Wagner, M. (2008). Methylenedioxymethamphetamine (MDMA)-assisted psychotherapy in subjects with chronic posttraumatic stress disorder: A Phase II clinical trial completed 19 September, 2008. Poster presented at the 24th Annual Meeting of the International Society of Traumatic Stress Studies, Chicago.

Moreno, F. A., Wiegand, C. B., Taitano, E. K., & Delgado, P. L. (2006). Safety, tolerability, and efficacy of psilocybin in 9 patients with obsessive-compulsive disorder. *Journal of Clinical Psychiatry*, *67*(11), 1735–1740.

Morgan, C. J. A., Muettzelfeldt, L., & Curran, H. V. (2008). Reclassifying psychoactive substances on the basis of their actual harms: an internet survey of drug users [Abstract]. *Journal of Psychopharmacology*, *22*(5), S05.

Murphy, P. N. (2007). Assessing drug-related harm. *Lancet*, *369*(9576), 1856.

Nutt, D. J. (2009). Equasy—an overlooked addiction with implications for the current debate on drug harms. *Journal of Psychopharmacology*, *23*(1), 3–5.

Nutt, D., King, L. A., Saulsbury, W., & Blakemore, C. (2007). Development of a rational scale to assess the harm of drugs of potential misuse. *Lancet*, *369*(9566), 1047–1053.

Sandison, R. A. (1954). Psychological aspects of the LSD treatment of the neuroses. *Journal of Mental Science*, *100*(419), 508–515.

Selvaraj, S., Hoshi, R., Bhagwagar, Z., Murthy, N. V., Hinz, R., Cowen, P., Curran, H. V., & Grasby, P. (2009). Brain serotonin transporter binding in former users of MDMA ('ecstasy'). *British Journal of Psychiatry*, *194*(4), 355–359.

Sessa, B. (2005). Can psychedelics have a role in psychiatry once again? *British Journal of Psychiatry*, *186*, 457–458.

Sessa, B., & Nutt, D. J. (2007). MDMA, politics and medical research: have we thrown the baby out with the bathwater? *Journal of Psychopharmacology*, *21*(8), 787–791.

Sewell, R. A., Halpern, J. H., & Pope, H. G., Jr (2006). Response of cluster headache to psilocybin and LSD. *Neurology*, *66*(12), 1920–1922.

Zarate, C. A., Jr, Singh, J. B., Carlson, P. J., Brutsche, N. E., Ameli, R., Luckenbaugh, D. A., Charney, D. S., & Manji, H. K. (2006). A randomized trial of an N-methyl-D-aspartate antagonist in treatment-resistant major depression. *Archives of General Psychiatry*, *63*(8), 856–864.