Powerful substances in tiny amounts

An interview study of psychedelic microdosing

by

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Table of Contents:

Abstract

Aims: This article presents a qualitative interview study of people who microdose with psychedelic drugs, which means that the user takes about one tenth of an ordinary recreational dose. **Design**: Respondents (n = 21) were recruited at several Internet fora for individual interviews via private messaging. Every participant was male, and the median respondent was in his 30s with a stable job and relationship and extensive entheogen experience. **Results**: Respondents tended to experiment with microdosing in phases, reporting mostly positive consequences from this form of drug use. Reported effects included improved mood, cognition, and creativity, which often served to counteract symptoms especially from conditions of anxiety and depression. There were also reports of various challenges with psychedelic microdosing, and some did not find the practice worth continuing. **Conclusion**: The study obtained evidence of a group of users taking small doses of psychedelics not for the purpose of intoxication but to enhance everyday functioning. While the study's findings are not generalisable, they may inform subsequent investigations with research questions and hypotheses.

Keywords enhancement, health effects, interview, microdose, psychedelic, qualitative

Introduction

To microdose with a psychedelic drug means to take a dose small enough to provide no intoxication or significant alteration of consciousness. Microdosing has been growing in popularity and visibility since James Fadiman recounted some self-experiment reports in his 2011 book *The psychedelic explorer's guide*, but has roots going back to 1970s psycholytic therapy and, according to Fadiman (2011), to indigenous healers and shamans who have "systematically and fully explored every dose level" (pp. 198- 199). The microdosing phenomenon has spread most recently over the Internet, where discussion fora enable users to share experiences and exchange information in ways that make new practices accessible for others. Its growing visibility has been reflected in substantial recent media coverage, with a number of reports especially about students and professionals microdosing with LSD in order to improve their concentration and problem solving (Nørgaard, 2017; Solon, 2016; Tande & Fliflet, 2017; Tollersrud, 2017; Williams, 2017). The overall impression from these reports is that microdosing affects mood, health, and cognition in generally positive ways, while allowing the user to carry on with everyday activities.

Searches through PubMed, ProQuest and Google Scholar databases confirmed that there was at the time of writing no published research on psychedelic microdosing to corroborate these anecdotal findings. However, much attention was given to the effects of larger doses of psychedelic substances by psychiatric researchers in the 1950s and 1960s, and one noteworthy finding was that psychedelic therapy sessions often resulted in long-term recovery from alcoholism (Abramson, 1967; for a recent meta-study see Krebs & Johansen, 2012). Clinical effect was also observed for a range of conditions including anxiety in terminal cancer patients and obsessive-compulsive disorder (see review in Nichols, 2004). These lines of research were curtailed by political developments, but have reemerged in recent years after a decades-long hiatus (Sessa, 2005). Recent preliminary results have indicated therapeutic effects from full doses of psychedelic drugs on depression and anxiety around life-threatening disease (Gasser *et al*., 2013; Griffiths *et al*., 2016; Grob *et al*., 2011; Ross *et al*., 2016), on substance dependence (Bogenschutz *et al*., 2015; Johnson, Garcia-Romeu, Cosimano, & Griffiths, 2014; Schenberg, de Castro Comis, Chaves, & da Silveira, 2014; Thomas, Lucas, Capler, Tupper, & Martin, 2013), and on various other somatic and psychological conditions (Carhart-Harris & Nutt, 2010; Johnstad, 2015). However, full doses of psychedelic drugs lead to experiences that are often very intense, and which have been reported to induce both acute panic reactions and toxic psychoses (Iversen, Iversen, Bloom, & Roth, 2009). While the notion of a direct relation between psychedelics use and mental health complications is subject to dispute (Hendricks, Thorne, Clark, Coombs, & Johnson, 2015; Krebs & Johansen, 2013), it would seem prudent to conclude that full doses of psychedelics have a potential to incur nontrivial adverse effects.

Microdosing, on the other hand, is not experientially intense, and has not been reported to result in negative health reactions in anyone. We must acknowledge that this use of psychedelics has not yet been described in academic literature beyond basic reports of its existence (Savulich *et al*., 2017; Sweat, Bates, & Hendricks, 2016), and that the current lack of information about adverse reactions is subject to change. Nevertheless, the anecdotal evidence currently available indicates that microdosing seems to be a promising candidate for some of the health benefits claimed for psychedelics while incurring minimal risk for mental health complications. The aim of this study was therefore to explore psychedelic microdose use by interviewing users about their experiences. Common patterns or themes in their responses could serve as hypotheses or research questions for subsequent investigations.

One way to understand the microdosing phenomenon is to see it in light of the literature on human enhancement techniques. Researchers have identified the growing use of enhancement drugs such as piracetam (Corazza *et al*., 2014), methylphenidate and modafinil (Hupli, Didz·iokaite, & Ydema, 2016), especially among university students, and performance-enhancing drugs have long been regarded as a problem in sports. Hogle (2005) analysed such enhancement drugs as an aspect of a broader range of enhancement technologies including cosmetic procedures, cyborg prosthetics, and genetic enhancement, and observed that humans have a long history of voluntary bodily modification. She argued that enhancement technologies differ from therapeutic interventions in that they may not have a starting point in deficiency, but found it difficult to distinguish precisely between the two. In a definition by Coveney, Gabe, and Williams (2011),

> A therapeutic intervention will restore normal or typical functioning with the aim of returning an

> unhealthy person back to a healthy state whereas an enhancement will improve or extend the abilities or capacities of a healthy individual (who is already functioning normally) outside of this normal or typical range. (p. 384)

They found the therapy-enhancement dichotomy to be a useful heuristic, but warned that it may also be limiting because of the ambiguity inherent in concepts such as health and normality.

Normative characterisations of enhancement drug use varied substantially between these researchers. Whereas Corazza *et al*. (2014) spoke of "abuse", Hupli *et al*. (2016) found that enhancement drug use by healthy individuals could best be understood as "functional drug use". Coveney *et al*. (2011) observed that the social acceptance of enhancement drugs rests in large part on the cultural authority of medical experts and may be subject to change. In an assessment of the need to regulate cognitive enhancement drugs, Ragan, Bard, and Singh (2013) found that regulation "would have to aim at minimizing the risks and harms of cognitive enhancement while maximizing the benefits" (p. 593).

Some researchers have also noted that media reports about enhancement drugs tend to exaggerate how widespread their use is and to over-emphasise their benefits (Partridge, Bell, Lucke, Yeates, & Hall, 2011). While I am not aware of any analysis specifically of media reports on psychedelic microdosing, it is possible that media coverage of this phenomenon conforms to the same pattern.

Method

Terminology

In this article, the term "microdosing" is used exclusively in the context of psychedelic drugs. However, the definition of the term "psychedelic" was unspecified in communication with respondents, and some mentioned microdosing experiments with drugs such as cannabis, which are not usually classified as psychedelics. These reports are noted briefly in the results section. Experiences of perceived therapeutic or enhancement effect are referred to as "positive", whereas unwanted effects are labelled "negative".

Study design

Using purposive sampling, current or former microdose users of psychedelic drugs were recruited for interviews via a variety of Internet fora dedicated to discussions of various psychedelic experiences. Only one of these fora was dedicated especially to microdosing, but there were usually at least a few discussion threads about the subject on each forum. Recruitment efforts used two separate strategies: one was to post a new thread describing the purpose of the study and asking for input, and then to contact individual users by private message for further questions; the other was to search the forum for previous entries relating to microdosing practices and then to contact eligible participants by private message. This two-pronged recruitment strategy was employed on seven different user fora, of which *The Shroomery*, *DMT-Nexus*, *NorShroom*, and *Reddit* produced a range of responses, while *The Hip Forums*, *Psychonaut*, and *Bluelight* did not produce substantial numbers of responses. Forum members who responded to initial recruitment efforts or had made noteworthy contributions to old discussions (N = 24) were contacted via private message. Some users who had tried microdosing only once or a few times without any noteworthy effect were not contacted for further interviews as I had nothing further to ask of them, but their experience of no effect is nevertheless noted in the results section. Three of the 24 eligible participants did not respond to the private message, while the remaining 21 gave their informed consent to participate. The study was designed in conformity with Norwegian Social Science Data Services ethical guidelines. A few quotations have been translated from Norwegian, and statements have been edited for brevity and relevance.

Because psychedelics are generally illegal, not all respondents were willing to provide demographic information. In order to reduce participation stress, only a minimum of such information was requested. Every respondent was male. Of the 17 who listed their age, the median age was early 30s. Four were single, five in a relationship, and eight engaged or married (three with children). Five participants were students, while nine were in full-time employment variously as a factory worker, a biologist, a hospital worker, a teacher, a cook, a

plant scientist, and in IT security; one was self-employed and two were unemployed/disabled. Five, including one of the unemployed, held master's degrees or PhDs. They had from one year to 25 years of experience with psychedelic drug use, with the median length of experience amounting to about 10 years. Thirteen had extensive microdosing experience and eight had experimented on a more sporadic basis.

In their discussion of Internet recruitment for qualitative studies, Hamilton and Bowers (2006) found that one of the strengths of this recruitment strategy was the potential to increase the appropriateness of each participant. This was indeed the case in this study, as each of the 21 interviewees made valuable contributions and must be regarded as highly appropriate for the study. It is difficult to imagine any non-Internet recruitment arena that could have provided the same level of access specifically to psychedelic microdose users. However, Hamilton and Bowers (2006) also found that participants recruited on the Internet probably have more education and higher incomes, thus potentially skewing findings. While the Internet is probably more accessible today to those with lower education and income levels than it was in 2006, it may very well be the case that Internet recruitment in this study served to exclude some drug users. Furthermore, users with some enthusiasm for psychedelic drugs were probably more likely to self-select for the study. The recruitment process therefore did not obtain a representative set of participants reflecting the general population of psychedelic microdose users.

Interviews were asynchronous and Internet-mediated, and conducted on a semi-structured basis. Such forms of interviewing have been validated by Meho (2006), who discovered a broad range of medium effects from using email to convey interviews. Advantageous effects included a possible increase in honesty and self-disclosure, as well as the elimination of transcription errors, while disadvantages included the loss of visual and nonverbal cues from facial expressions and body language. In conclusion, Meho found no overall negative impact on data quality. Consistent with Meho's finding of an increase in self-disclosure, Bargh, McKenna, and Fitzsimons (2002) discovered that the relative anonymity available on the Internet afforded users increased opportunities for expressing aspects of themselves that they would be inclined to hide from others in face-to-face communication. By allowing for a high degree of participant anonymity, email interviews for this study probably served to facilitate participation from interviewees who would otherwise have balked at describing illegal activities to an unfamiliar researcher. According to Hamilton and Bowers (2006), another benefit of asynchronous email interviewing is that it affords the researcher the opportunity to reflect on previous responses from the interviewee and, on this basis, to pose more thoughtful follow-up questions than might be possible in a face-to-face conversation. I found this feature to be beneficial for the interviewing process.

Typical questions used to guide the interview were:

1. Which psychedelics have you microdosed?
2. How much experience do you have with microdosing?
3. Do you microdose in cycles or continuously? How often do you do it?
4. What effects do you get from microdosing?
5. Have you noticed any negative effects?
6. How do you feel the day after a microdose?

Recruitment for the study was continued until new responses consistently conformed to patterns identified from earlier responses, at which point significant new information was deemed unlikely to emerge. Most interviews were completed within a few weeks, but some were extended for several months in order to obtain information about ongoing microdosing practices. As interviews took the form of written communication, transcription was unnecessary. Data were analysed using thematic analysis and Kvale and Brinkmann's (2015) procedure for meaning condensation. Statements from interviewees were shortened and categorised according to topic, and themes were thereupon constructed on this basis in an open-ended, exploratory, and data-driven comparative analysis. Topics were a priori areas of interest such as usage patterns, therapeutic effects, and negative side effects, while themes represented areas of agreement related to a given topic among a group of interviewees. Participant statements were accepted at face value, and there was no theoretical interpretative framework informing the analysis. However, the interview process allowed for critical perspectives and for the resolution of ambiguities through follow-up questions. Participants were asked to read through and verify the use of their quotations.

The study emphasised the preservation of participant anonymity, and aimed to ensure that no participant

would be identifiable either to the researcher or to readers of publicised material. Participants communicated via anonymous messaging that protected their identity at least from the researcher. Unless they were using camouflage technology such as The Onion Router (Tor), their IP addresses would have been accessible to the forum service provider, but this would not have served as a privacy concern beyond the risk they were already incurring through their normal use of this forum. Participants were encouraged not to reveal information about their location, background or circumstances that might indirectly reveal their identities. Their pseudonyms are not reported, as these are often traceable across a variety of Internet sites, and demographic information has been delinked from narratives. While full Internet anonymity is elusive, I believe that participation in the study did not compromise privacy to any significant extent.

The emphasis on anonymity entailed that signed consent letters could not be obtained, and incurred the risk that minors might pass themselves off as adults and gain access to a study discussing the use of illegal drugs. However, it is my impression that microdoses are of little interest to minors, and I believe that no attempts at such subterfuge were made. Recruitment letters and later communication with respondents were carefully phrased so as to not give the impression that the author condoned illegal drug use.

Results

Microdose regimen

Respondents generally regarded microdosing as being compatible with most everyday activities. Some would microdose in the mornings of workdays, while others preferred to limit this activity to afternoons and non-working days. The most commonly used psychedelics for microdosing were psilocybin-containing "magic mushrooms" and lysergic acid diethylamide (LSD). There were also reports of microdosing experiences with *Salvia divinorum*, *Amanita muscaria*, *Peganum harmala* (Syrian rue), *Echinopsis pachanoi* (San Pedro cactus), *N,N*-dimethyltryptamine (DMT), 2,5-Dimethoxy-4-methylamphetamine (DOM), and cannabis. Some users had experimented with a broad range of psychedelic substances, while others had limited this use to one specific psychedelic:

> The only traditional psychedelic I have microdosed is mushrooms. I find this to be extremely beneficial spiritually, physically, and mentally but have no experience with other traditional psychedelics as a basis for comparison.
>
> (ID14) I've had good success with Amanita as a daily tonic for wintertime blues. (ID13)

Doses were usually constrained to about a tenth of a full dose. For LSD, this amounted to somewhere between 10 and 25 mcg, and for *Psilocybe cubensis* mushrooms to 0.1-0.3 g. Some reported taking up to a quarter of a full dose, but this was usually regarded as a mini-dose rather than a microdose, and was not found to be compatible with work and everyday activities. Respondents sometimes found it difficult to specify the exact dose they were taking. Some indicated that their microdose regimen was informed by extant literature on psychedelic microdosing. These were some typical statements about dosage:

> I normally cut up a single blotter of 100 or 150 mcg into 8 pieces, giving microdoses in the range of 12.5 to 18.75 mcg. (ID38)
>
> I have microdosed frequently, generally following Fadiman's recommendation of 1/10th of a dose every four days. (ID33)
>
> I dose 10 mcg LSD twice per week. I came to this amount by administering doses at 5 mcg intervals within the following range [5-25]. I have found that 10 mcg is the most beneficial. Any more and I'm a little too impressionable to distraction, any less and there's no benefit. (ID39)

For experienced microdosers, the practice was usually regarded as a cyclic activity, with microdosing periods lasting from a few weeks to a few months. Within such a period, the respondents typically dosed one to three times per week, although some reported dosing on a daily basis. Less experienced users reported occasional experiments without any stable regimen. Dosing a few times a week did not seem to result in significant build

up of tolerance (abatement of positive effects), although with one reported exception for DOM. There were conflicting reports on tolerance build up from daily microdosing and about the impact of microdose tolerance on full doses. Some frequent microdose users experienced a build up of tolerance, while others found no such effect:

> In the last year, I have been experimenting with LSD microdoses quite frequently. But in the past two months, I have gone from taking it every third day to every day. What amazes me is the fact that I don't seem to feel any tolerance build up at all. (ID38

> Surprisingly, a one-day break is sufficient for avoiding tolerance. This went against the conventional wisdom online suggesting that a few days in between was necessary. Dosing on consecutive days saw tolerance, then headaches. (ID39)

Experienced therapeutic effects

Respondents generally agreed that proper microdoses (about a tenth of a full dose) of LSD and psilocybin did not result in any intoxication. Some respondents experienced no effect at all from microdosing, and therefore abandoned the practice after a few attempts, but the majority reported some effect that they regarded as positive. The most commonly described effects were health related, with a benign influence noted especially on states of depression and anxiety:

> I have had very positive results from infrequent psilocybin microdosing. I have found fast and relatively long-lasting relief from depression and social anxiety doing this, as compared to other pharmaceutical options I've been offered such as SSRIs [selective serotonin reuptake inhibitors], and without the intolerable (for me) side effects.

> (ID29) The best relief I ever had was in the 0.1 g to 0.2 g range of *Psilocybe azurescens*. This helped immensely with my manic bipolar depression and suicidal ideations. (ID17)

Therapeutic effect was also reported for pain management and for a range of conditions including obsessive-compulsive disorder (OCD), post-traumatic stress disorder (PTSD), narcolepsy, and migraines. A *Peganum harmala* microdose regimen was celebrated by some for its help in quitting cigarette smoking. Several respondents reported that they had discovered some psychedelics to work better for their condition than others, but there was no agreement on which psychedelic was most effective.

> I have been dealing with symptoms of narcolepsy for some years now. I would nod off at meetings, telephone calls, and mundane task at the PC. LSD microdoses have really been a game changer. The amount of energy I feel is profound. In terms of quality of life, it is the difference between being a walking zombie, barely keeping eyes open and looking at every daily mundane task as a struggle, and being a normal functioning person with an extra energy boost and creative tendencies. (ID38)

> My wife and I had great success in pain management using mushrooms rich in baeocystin and norbaeocystin (*Psilocybe cyanescens* and *Psilocybe azurescens*). Cubensis don't do the same. (ID17)

> I have microdosed with psilocybin mushrooms and DMT, both to prevent oncoming migraines from playing out. I cannot say if the tiny amount of mushrooms helped quash the migraine, but the small amounts of vaporised freebase DMT definitely stopped some migraines from playing out to their full extent. (ID34)

Experienced enhancement effects

Besides the effects on health issues, respondents commonly reported what they regarded as a positive influence from microdosing on energy, mood, and cognition. This allowed them to function better in everyday life even when they had no specific health issues. However, the distinction between treatment and

enhancement was not always clear. A few respondents microdosed specifically in order to enhance their capacity for academic study or to increase their efficiency in the workplace. These were some typical descriptions of enhancement effect:

> Since microdosing mushrooms, I definitely feel as though a "mental fog" has been lifted and this allows me to be much more productive and functional. (ID14)

> I had a great day! Very calm mind, emotionally in balance. (ID23)

> I think micro doses can transpire a subtle alpha aura as one navigates the day with fluidity. And you're smoothly infusing your environment with that pure trippy energy that this plasticised world silently begs for. (ID13)

> Before microdosing I would have never said I have mental health issues, but I am forced to reconsider as when microdosing I feel I'm living in the brain of an incredibly mentally healthy person. (ID39)

The enhancement of everyday functioning sometimes resulted in an improved capacity to relate to other people. Some respondents claimed that microdosing psychedelics increased their openness and extraversion:

> I feel more open to other people. At home with my family, I feel better equipped to deal with disagreement, and my emotional reactions are less automatic. My mood improves, and I have better contact with my feelings and less restlessness. I more often take the initiative to talk. (ID27)

A few respondents utilised the perceived energy and mood enhancement for spiritual practice, and found microdosing to be helpful in these pursuits:

> I get bright moods, good introspection in meditation, and a generally meditative, contemplative mood. (ID21)

There were also a few reports about combining psychedelic microdoses with full doses of alcohol, cannabis or 3,4-Methylenedioxymethamphetamine (MDMA). These drug combinations were mostly taken for recreational purposes.

> My experience is that a microdose of LSD taken a few hours before a dose of MDMA opens me up, in a sense, so that I feel the MDMA more strongly and intimately. (ID36)

> My kids were away, so I spent the day with my wife lounging in the back yard, swimming in the pool. We had some drinks, got high, and I threw back a microdose of mushrooms. We got cozy in the pool, then I took her inside and we made love. Then we made burgers on the grill, smoked more weed and drank more. What a great day. A microdose on a lazy summer day - awesome! (ID10)

Cannabis is known to intensify the effects of psychedelics, however, and one respondent reported a "bad trip" experience resulting from this combination. There were also conflicting reports about the aftereffects of microdosing, with some users finding themselves back to normal the day after dosing and others experiencing a slight change in their energy level. One respondent reported of a sustained relief from anxiety lasting up to a week after a cycle of microdosing. These were some typical responses about aftereffects:

> Today everything is back to normal, I don't notice any improvement or worsening. I have a weak headache, but that may be because I slept longer than usual. (ID26)

> I definitely felt an afterglow just like if you dose high enough for an actual psychedelic experience. (ID3)

There was also broad agreement among the respondents that the two most commonly microdosed psychedelics - psilocybin and LSD - were quite different in their effects, and some had developed a clear

preference for one or the other. Respondents agreed that LSD had a more stimulating effect than psilocybin, which some welcomed and others found uncomfortable:

> It's weird: I like mushrooms more than LSD, but favour LSD microdoses over mushroom microdoses. LSD is just more practical for work and play, bounding energy and on target mentality. Mushroom microdoses are more of a personal and "fresh" interaction with the universe. (ID13)

> I find that microdosing mushrooms works fine, but LSD microdoses are very uncomfortable as they are too stimulating for me. (ID19)

Reported challenges

Despite the general emphasis on subtle benign effects, the respondents in this study also pointed to a number of challenges associated with microdosing practices. Most commonly reported was the problem of overdosing. Psychedelic drugs are well known for their powerful psychoactive effects, and the resulting state of consciousness is not regarded as compatible with everyday social activities. While there were no reports of accidentally taking a full dose when attempting to microdose, several respondents had unintentionally verged into the terrain of a mini-dose that led to uncomfortable situations:

> I experimented with microdosing mushrooms, but went a bit too far with 0.25 g while at work. I don't know if it was because of the situation, my empty stomach or because I was extra sensitive during that period - but I started tripping quite noticeably! Fortunately it turned out alright. At this level of dosage the peak only lasts for about an hour. (ID25)

> I was feeling very tired and had a martial arts class to attend for the first time, so I didn't want to make a bad impression. This was my second time microdosing shrooms, and I dosed around 0.25-0.35 g a few hours before in an attempt to peak well before the class and still just be stimulated and in a good positive mood for it. This backfired massively as I had a large meal around the time of dosing and it only really kicked in once I got to the class. I found it very hard to follow instructions and had a huge body load. (ID5)

Some respondents also found that microdosing could exacerbate certain conditions or symptoms. Benign health effects that users experienced in the early phase of microdosing did in some cases disappear or even reverse themselves after a long period of use.

> One note of caution: if you drink alcohol, don't microdose if you are feeling even slightly hungover, it will get worse, not better. Other than that, be sure to take your first dose on a day where you don't have too much going on as overshooting the mark can be less than productive. (ID33)

> I noticed that after a certain point, the benefits fade, and microdosing instead serves to exacerbate my mental health problems. (ID17)

Even when no such adverse effects have been identified, some expressed uneasiness over the fact that the impact of long-term psychedelics microdoses on the brain remains unstudied and unknown:

> Honestly I must admit that it is a bit unnerving to be on the forefront of microdose experimentation. I haven't yet talked to or met anyone who has taken this for as long as I have. (ID38)

A few respondents also mentioned insomnia as a problem, especially if they microdosed late in the day. This was connected to the feeling of overstimulation from LSD microdoses that was reported by several respondents, and both overstimulation and insomnia contributed to a "bad trip" experience reported by one participant who mixed a microdose of LSD with a full dose of cannabis. Another respondent reported that the feeling after taking a microdose reminded him of the early build-up stage of a full trip, which for him was often accompanied by tension.

Discussion

The purpose of this study was to explore how "ordinary" users of psychedelics approach psychedelic microdosing. The selection of users included in this study was not, however, representative of the population of psychedelics users, and the findings of the study therefore have no claim to general validity. Despite this shortcoming, the findings may serve to acquaint researchers with the, as of yet, understudied phenomenon of psychedelic microdosing.

The microdosing practices reported in this study generally conformed in regimen and dose to the recommendations published by Fadiman (2011), although some users experimented with daily microdoses. LSD and psilocybin-containing mushrooms were most commonly used, but some respondents also microdosed a wide range of lesser-known psychedelics and other psychoactive drugs. Respondents for the most part reported what they regarded as positive effects from microdosing, with few side effects. Microdoses most commonly served as mood and cognitive enhancers, allowing people to function at what they felt was a higher level than usual. There are clear parallels between psychedelic microdosing and the use of cognitive enhancement drugs among healthy individuals for performance improvements described by Corazza *et al*. (2014) and Hupli *et al*. (2016), as both forms of drug use can be motivated by a wish for enhanced performance in the workplace or in academic study.

However, there was also a therapeutic motivation for psychedelic microdosing among some of the respondents in this study who suffered from conditions such as anxiety or depression. These findings are congruent with reported effects from full doses of psychedelic drugs on conditions of depression and anxiety (Carhart-Harris & Nutt, 2010; Gasser *et al*., 2013; Griffiths *et al*., 2016; Grob *et al*., 2011; Johnstad, 2015; Ross *et al*., 2016). Reports about the efficacy of microdosing practices for conditions such as substance dependence, OCD, and PTSD also have parallels in research on therapeutic effects from psychedelics in full doses (Abramson, 1967; Bogenschutz *et al*., 2015; Johnson *et al*., 2014; Krebs & Johansen, 2012; Nichols, 2004; Schenberg *et al*., 2014; Thomas *et al*., 2013). It should be noted, however, that in the present study these observations were limited to one or a few individuals. Clinical research on microdosing should probably first look into putative anxiolytic and antidepressive effects, but need not end there.

The lack of a clear distinction between therapy and enhancement that has been pointed to by anthropologists and sociologists who study enhancement technologies (Coveney *et al*., 2011; Hogle, 2005) is echoed in this study. Some respondents pointed to specific deficiencies that their use of psychedelic microdoses was intended to address, but there was an overlap between the use motivated by such therapeutic effects and the use motivated by an effect of enhancement. In either case, the desired effect from microdosing was to be lifted out of a state of relative limitation into a state of higher functioning. The difference was that in therapeutic use, the state of limitation corresponded with a specific medical diagnosis. One respondent explicitly challenged the notion that his "normal" or pre-microdosing state of being deserved the designation "healthy", even though he had not been diagnosed with any specific ailment.

Some respondents experienced no effects from microdosing at all, however, and several others emphasised that, despite their positive experience, microdosing is no miracle cure. There were some indications that psychedelic microdoses might not retain their perceived beneficial effects over longer stretches of time, and that the use should therefore be constrained to phases, which was indeed the most common approach to microdosing among respondents with extensive experience. This reduction of effect over time might limit the medical value of microdosing psychedelics, and would seem to be an important area of investigation for subsequent clinical research of microdosing.

The most commonly reported challenges with microdosing were overdosing and insomnia. Overdosing in this case means going beyond microdose territory into a mini-dose that has some intoxicating effect. Such minidoses are not by themselves overly problematic for experienced psychedelics users, but might have serious negative consequences for users who combine microdosing with work, driving a car, and other activities not compatible with drug intoxication. The overdosing problem applies both to LSD and to psilocybin-containing mushrooms. The former is fully active in doses of a hundred micrograms, and a microdose is often obtained, rather inexactly, by cutting a blotter into separate pieces. Mushrooms for their part may be subject to a natural variation in psilocybin content (Ra¨tsch, 2005). Clinical applications of microdosing could solve

this problem by supplying standardised microdoses, but would have to trust their clients not to take several doses at the same time.

The few negative reports about microdosing in this study were not apparently a result of overdosing, nor is there any other obvious explanation for their occurrence. While these negative experiences constitute a minority, it is important to note that some people may experience distinctly unpleasant effects as a result of microdosing. The reported "bad trip" might appear to be a product more of cannabis use than of the LSD microdose, but damage-reduction publications such as *tripsafe.org* often warn that cannabis might potentiate psychedelic drugs.

The question of whether microdosing of psychedelic drugs should be characterised as "abuse", which was Corazza *et al*.'s (2014) label for piracetam use among healthy individuals, or as "functional drug use", which Hupli *et al*. (2016) argued is the best way to understand the use of cognitive enhancement drugs, is not easily answered. Psychedelics are designated as drugs of abuse in most of the world, but there is a substantial research literature that indicates that their use may have therapeutic effect. It is possible that microdosing may allow users to procure some of the perceived positive effects of these drugs while avoiding the problems that may follow from taking them in full doses.

As a social phenomenon, we can perhaps understand psychedelic microdosing in light of Coveney *et al*.'s (2011) observation that the cultural authority of medical experts may be subject to change. Much medical knowledge is now readily available on the Internet, and electronic fora for psychedelic users serve as knowledge repositories that integrate shared user experiences with medical and neuroscientific information. This has resulted in increased knowledge availability (or at least in the perception of increased knowledge availability), which may have caused a corresponding decrease in the cultural authority of medical experts. The growth of microdosing may therefore reflect a social development in which ordinary people use the Internet for medical advice and feel empowered to take personal responsibility for their medication needs, pursuing therapy and enhancement through means that the medical establishment does not recognise and would perhaps frown upon.

There are no published studies on microdosing with which the findings of this study may be compared. The reports of therapy and enhancement, which constitute the majority here, conform to the findings of previously published anecdotal reports (Fadiman, 2011; Solon, 2016; Waldman, 2017), while the reports of no effect or negative effect are, as far as I can determine, without counterpart. This may reflect a bias towards beneficial effects in anecdotal reports, which Partridge *et al*. (2011) found to be a problem for media reports about enhancement drugs, or perhaps it may be that the method used in this study has been more conducive to obtaining balanced information.

There is no way to differentiate between drug effects and positive or negative expectation effects (placebo/nocebo) in these data, but the study affords an understanding of how "ordinary" users of psychedelics approach psychedelic microdosing. Several respondents expressed nuanced views about the relative benefits and disadvantages of microdosing that were not in any obvious manner indebted to placebo or nocebo effects. They also reported discovering specific practices that have worked well for them, compared to others that were found to be ineffectual or subject to negative side effects. Confidence in the reports is therefore increased by their high degree of specificity, as curative or symptom-abating effect was often reported only for one of several drugs that respondents used.

Another overall finding from this study is the value of tapping the psychedelic Internet community for academic studies. It is unknown whether this segment of Internet-active users is representative of the general psychedelic-using population, but the discussion fora frequented by these users are probably among the best recruitment arenas available to researchers. The respondents in this study were reflective, knowledgeable, and fully capable of expressing their views, and their participation would be an asset to any study of psychedelic drug use. It is possible, however, that a less erudite group of psychedelics users would have a less constructive and self-reflective approach to microdosing, and the study has nothing to say about the attractions of microdosing to women. The findings from this study should therefore be taken to reflect the microdosing experiences of a resourceful group of male psychedelic users, and have value primarily to the extent that they may provide subsequent investigations with research questions and hypotheses.

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