Broadening Your Mind to Include Others: The relationship between serotonergic psychedelic experiences and maladaptive narcissism

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Abstract

Rationale

There has been a recent increase in research showing that classical serotonergic psychedelic (CSP) drugs may be used to ameliorate certain health issues and disorders. Here we hypothesized that CSP experiences, through their ability to induce awe and ego-dissolution, may result in a reduction of maladaptive narcissistic personality traits, such as a strong sense of entitlement and lack of empathy.

Objectives

Our objective was to investigate whether high levels of awe and ego dissolution during recent CSP experiences are associated with current lower levels of maladaptive narcissism.

Methods

In this pre-registered high-powered (N = 414) study, we used an online survey including several validated scales to test our hypothesis.

Results

A statistically significant mediation model indicated that recent CSP-induced awe experiences were associated with increased feelings of connectedness and affective empathetic drive, which in turn were associated with decreased exploitative-entitled narcissism. This relationship held even when taking into account sensation-seeking personality features. We found no evidence for feelings of ego dissolution during the experience to have the same effect.

Conclusions

Feelings of awe, but not ego dissolution, during recent CSP experiences were associated with increased feelings of connectedness and empathy, which in turn were associated with decreased levels of maladaptive narcissism personality features. This suggests that there is a therapeutic potential of CSPs for disorders involving connectedness and empathy, such as the treatment of pathological narcissism and other clinical disorders, and that the induction of connectedness through awe appears to be the driving force behind this potential.

Keywords: psychedelics, narcissism, awe, empathy, ego, connectedness, serotonergic, personality

1. Introduction

In recent years, there has been a steady increase in research suggesting that certain drugs typically classified as recreational drugs may be used effectively in mental health research and care, in particular for depression (Carhart-Harris et al. 2018a; Singh et al. 2016), post-traumatic stress disorder (Mithoefer et al. 2018), and substance addiction (Morgan et al. 2017). Psychedelic drugs in particular hold a great potential not only for treating a wide range of clinical disorders (Carhart-Harris and Goodwin 2017), but also for fostering prosocial behaviour and helping to address non-clinical but problematic interpersonal styles and behaviours. Several research findings have indicated for instance that psychedelics may be useful for treating empathy-related disorders (Pokorny et al. 2017) and that psychedelics induce self-transcendent states and emotions such as feelings of connectedness (Lyons and Carhart-Harris 2018; Watts et al. 2017) and awe (Hendricks 2018). These experiences in turn may increase prosocial behaviour (Piff et al. 2015). As of yet, it is unclear however whether psychedelics, could also have beneficial effects for *maladaptive narcissism*. Maladaptive narcissism is associated with poor well-being and interpersonal problems (Cai and Luo 2018). Following the beneficial potential of psychedelic drugs for mental health outcomes, here we investigated the relationship between narcissism and psychedelic drug use. More specifically, we studied whether psychedelic drugs experiences may have affected levels of narcissism through experiences of awe and ego dissolution. These experiences may in turn have positively affected feelings of connectedness and empathy, which are associated with lower levels of maladaptive narcissism.

1.1 Psychedelic experiences: Mysticism, awe, and ego dissolution

Classic serotonergic psychedelics (CSPs) are a group of psychoactive drugs the acute effects of which include substantial changes to sensory perception, mood, sense of self, relationship to external reality, and sense of passage of time (Preller and Vollenweider 2016). The effects of serotonergic psychedelics are primarily mediated by the agonism of 2A serotonin receptors (5HT_{2A}R) (López-Giménez and González-Maeso 2017). CSPs include – among other substances: lysergic acid diethylamide, (LSD); psilocybin (found in psilocybe and other fungi; its metabolite psilocin is what binds to 5HT_{2A}R); N-N-dimethyl tryptamine (DMT); ayahuasca (which combines plant-derived DMT with plant-derived monoamine oxidase inhibitors to render the DMT orally potent); 5-methoxy-dimethyl tryptamine (5-MeO-DMT, found in plants and the venom of the Sonoran Desert Toad); and mescaline (the active ingredient of psychoactive cacti such as peyote and San Pedro). These various drugs have remarkably similar acute subjective effects (Halberstadt 2015), though the duration of these effects varies between different drugs.

Clinical research suggests that CSP-assisted therapy – in which patients take a relatively mild or a large dose of psychedelics under the supervision of a therapist - can help to alleviate psychological distress and different mental health problems (see Carhart-Harris and Goodwin 2017 for an overview), including distress associated with life-threatening illness (Griffiths et al. 2016); various forms of addiction including alcoholism and tobacco addiction (Bogenschutz et al. 2015; Johnson et al. 2017; Morgan et al. 2017), and recurrent and treatment-resistant anxiety and depression disorders (Carhart-Harris et al. 2018a; Palhano-Fontes et al. 2019). Such effects on mental health are likely mediated by the extent to which participants have mystical-type and self-transcendent experiences during their CSP ‘trip’ (Bogenschutz et al. 2015; Griffiths et al. 2016; Johnson et al. 2017; Roseman et al. 2018; Ross et al. 2016). Psychedelics can reliably induce such states in users (Beauregard 2011; Nichols 2016) and the altered state of consciousness, or more specifically, a ‘peak-psychedelic’ or mystical experience, could be the driving mechanism underlying the effect of CSPs on mental health. Mystical experiences are characterized by feelings of unity, sacredness, ultimate reality, transcendence of time and space, deeply felt positive mood, and ineffability (Pahnke 1963). These states are also often characterised by strong feelings of awe, which involves perceived vastness and a need for accommodating one’s cognitive models, and which has been hypothesised to be the main psychological mechanism of action for psychedelics’ therapeutic effects on mental well-being (Hendricks 2018).

This notion is further supported by the observation that both psychedelic and awe experiences are characterized by a reduced sense of the self (Yaden et al. 2017). An extreme instance is the experience of ego dissolution, whereby the boundaries of the ego are temporarily disrupted, the self is felt to be integrated into a greater whole, and an increased feeling of unity with one’s surroundings is experienced. At a neural level, the experience of ego dissolution has been associated with a reduced activity of the so-called Default Mode Network (DMN) – a network of brain regions that has typically been implicated in self-referential processing and mind wandering (Carhart-Harris et al. 2012; Lebedev et al. 2015). Interestingly, the experience of awe is also accompanied by a reduced activation of the DMN (van Elk et al. 2019)– in line with the subjective reports that participants literally experience a smaller self during awe (Piff et al. 2015; van Elk et al. 2016). The degree of ego-dissolution experienced during a psychedelic ‘trip’ has previously been correlated with positive and lasting impacts on well-being (Nour et al. 2016), in line with previous findings that scores on mysticism scales predict persisting changes in well-being after psilocybin use (Barrett et al. 2015) and with observations that the experience of ‘deselfing’ in awe underlies its prosocial and pro-environmental effects (Bai et al. 2017a; Piff et al. 2015).

Such findings may be of particular importance for mental health conditions and maladaptive trait profiles that involve a distorted view on or sense of the self. We suggest that narcissism may be one such condition, given that the experience of ego-dissolution and the reduced focus on the self, as induced by psychedelic drugs appear antagonistic to the self-focus and self-importance that is

characteristic of high trait narcissism. Moreover, awe has been shown to foster humility (Stellar et al. 2018), to reduce self-focus and to increase collective engagement (Bai et al. 2017b) - all of which also appear antagonistic to narcissism. Awe also induces prosocial feelings and values and tends to diminish entitlement (Piff et al. 2015) – a repeatedly identified facet of trait narcissism (Gentile et al. 2013; Raskin and Terry 1988). One way in which this may happen is by occasioning feelings of a ‘small self’ or ‘self-diminishment’ (Piff et al. 2015), in which an individual and their concerns appear small and unimportant (often involving a comparison to something experienced that appears vast or important).

1.2 Narcissism, interpersonal issues, and well-being

The American Psychiatric Association describes low empathy as one of three components of a pattern it describes as the essential features of the pathological form of narcissism, Narcissistic Personality Disorder (NPD), in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5®; American Psychiatric Association 2013), the others being a pervasive pattern of grandiosity and need for admiration. Pathological narcissism is associated with impairments in affective (but not cognitive) empathy (Baskin-Sommers et al. 2014) and trait narcissism is also negatively correlated with empathy, and in particular affective empathy (Urbonaviciute et al. 2017). Affective or emotional empathy is the vicarious experience of a target’s emotions as one’s own, while cognitive empathy involves taking the perspective of others (see Cuff et al. 2016 for a review of the distinction). The relationship between trait narcissism and empathy is driven in particular by facets of narcissism identified as ‘maladaptive’ (Hepper et al. 2014b), in particular entitlement and exploitativeness, which both encompass a harmful perceived superiority of self over others. Recent findings also suggest that narcissists have an issue with their motivation with, rather than an inability to being empathic, in line with growing emphasis in the literature on the distinction between these two facets of empathy (Zaki 2014): while narcissists tend to lack empathy, they can nonetheless engage in empathy when instructed take the perspective of the other person (Hepper et al. 2014a).

Overall, trait narcissism is predictive of interpersonal problems, including pathological antagonism, narcissistic personality disorder, psychopathy, and externalising behaviours (Gentile et al. 2013). However, narcissism as a personality trait (as measured by the Narcissistic Personality Inventory, NPI; Raskin and Terry 1988) has also been positively correlated with some indicators of subjective well-being, including increased self-esteem and reduced neuroticism (Sedikides et al. 2004). By contrast, the exploitativeness and entitlement narcissism (EE narcissism) facet of NPD is *negatively* correlated with subjective well-being, including a positive correlation with neuroticism (see for an overview, Cai and Luo 2018). It is also the facet of narcissism most strongly associated with interpersonal issues such as antagonism, disagreeableness, and psychopathy (Ackerman et al. 2018), and predicts other problematic behaviours such as aggression (Cai and Luo 2018), conduct

problems such as delinquency in youth (other NPI facets fail to predict such outcomes; Barry et al. 2007), and offender status (of seven NPI subscales examined in a study of youth offending and narcissism, only entitlement significantly predicted being in prison; Hepper et al. 2014b). As Brown and colleagues note, “the EE subscale of the NPI often carries the bulk of the variance in antisocial feelings and behaviors associated with the full NPI.” (Brown et al. 2009).

1.3 Psychological mechanisms: Connectedness and empathy

Recently, the potential for utilising psychedelics as a course of therapy for psychiatric disorders involving low levels of trait empathy, such as psychopathy, has been suggested as a promising line of inquiry (Pokorny et al. 2017). Here, we suggest that psychedelic experiences might also be inversely related to narcissism, and in particular maladaptive/EE narcissism. Some previous findings suggest that this may be indeed be a promising avenue of research, by demonstrating that compared with placebo, experimental administration of psilocybin led to significantly higher increases in self-rated altruistic/positive social effects and positive behaviour changes (Griffiths et al. 2006). Community observer ratings confirmed positive changes in participants’ behaviour and attitudes, both at two months (Griffiths et al. 2006) and fourteen months after administration (Griffiths et al. 2011). Such changes suggest reduced narcissism, and especially maladaptive narcissism given its strong correlation with antagonism (Ackerman et al. 2018) and being disliked socially (Paulhus 2001).

Empathy – and in particular emotional or affective empathy (as opposed to cognitive empathy) – can be affected by classic serotonergic psychedelics (CSPs). The experimental administration of both LSD and psilocybin has been shown to acutely increase levels of emotional empathy, but not cognitive empathy (which is either unaffected or reduced; Dolder et al. 2016; Pokorny et al. 2017; Preller and Vollenweider 2016). An observational study of psilocybin users found that enhancements in valence-specific emotional empathy persisted for seven days after use (Mason et al. 2019), but if and how much longer such effects persist has yet to be studied experimentally. In a cross-sectional study, Lerner and Lyvers (2006) found that psychedelics users had higher emotional empathy levels than individuals without a history of drug use.

CSPs’ ability to instil a persisting sense of connectedness – to the self, to other people and to the universe - has also been hypothesised as another therapeutic mechanism of action (Carhart-Harris et al. 2018b). Watts et al. (2017) found that, in 6-month follow-up interviews following a psilocybin clinical trial for treatment-resistant depression (Carhart-Harris et al. 2016) all patients made reference to a renewed sense of connectedness. Indeed, a sense of connectedness is pivotal to psychological well-being and recovery (Leamy et al. 2011; Lee et al. 2008), while a lack of deep connections to others has been described as a core element of narcissism (Twenge and Campbell 2009).

In light of this evidence, we hypothesised in the current study that a previous significant experience with CSPs would be inversely related to current maladaptive narcissism. We hypothesize

that such an effect is mediated by previous experiences of awe and ego-dissolution, which in turn are associated with affective empathy and a sense of connectedness. Our theoretical model is pictured in Figure 1. By testing this model, we aim to answer the question: Is any relationship between CSP use and maladaptive narcissism sequentially mediated by, first, awe and ego-dissolution experiences and, second, affective empathic drive and connectedness?

Our study used a correlational approach, and as such, we are aware that we therefore cannot make causal inferences about the effects of psychedelics on narcissism. Instead, the critical prediction that we set out to test in our model is to what extent any relation between psychedelic drug use and narcissism is mediated by experiences of awe and ego-dissolution. We pre-registered all our hypotheses and analysis plan on the Open Science Framework prior to conducting the study (<https://osf.io/nmh74/registrations>).

Figure 1: Hypothesised model of the pathway from CSPs use to reduced maladaptive narcissism

2. Methods and materials

2.1 Participants

Five hundred and eighteen participants (age range 18-78 years old, age $M = 31.9$, $SD = 12.3$) completed our online survey on the secure survey platform Qualtrics, of which 366 (70.7%) identified as male, 138 (26.6%) as female, and 14 (2.7%) as other. 414 participants (age range 18-78 years old, age $M = 30.0$, $SD = 11.5$) of these participants had had an experience with classic serotonergic psychedelic drugs (henceforth CSP users), and filled out the survey for the most awe-inspiring, impressive, significant, or emotionally intense experience they had had while under the influence of psychedelics over the past 5 years. Of the CSP users, 310 (74.9%) identified as male, 91 (22.0%) as female, and 13 (3.1%) as other.

Of the CSP users, for the psychedelics experience they described in the survey, 179 had taken psilocybin (45.0%), 129 LSD (32.4%), 32 DMT (8.0%), 21 Ayahuasca (5.3%), 5 mescaline/peyote (1.3%, results were combined because mescaline is the psychoactive ingredient of peyote), 2 5-MeO-

DMT (0.5%), and 16 other (4.0%; including 2CP and 4-HO-MET). In addition, 12 had taken a combination of CSPs (3.0%), and 13 had taken a combination involving another, non-CSP drug in addition to the CSP (3.3%). Due to low numbers for mescaline/peyote and 5-MeO-DMT, we decided to classify these together with ‘other’ for subsequent analyses. A majority (251; 60.6%) of these participants indicated residence in the USA, 50 (12.1%) in the UK, 23 (5.6%) in Canada, 13 in Germany (3.1%), and 11 in Australia (2.7%), with remaining participants divided amongst 31 other countries of residence (with fewer than 10 participants in each country). As regards their religious or spiritual affiliation, the largest group of participants were those identifying as spiritual but not religious (161; 38.9%), followed by 52 atheists (12.6%), 48 ‘nones’ (no religion, 11.6%), 39 agnostics (9.4%), 24 Christians (5.8%), 16 indifferent (3.9%), 13 secular humanists (3.1%), 9 Buddhists (2.2%), 6 (neo-)Pagans (1.4%), 2 Jewish (0.5%) and 44 ‘other’ (11.6%). Self-reported spirituality and religiosity was measured on a scale from 0 (“Not at all”) to 6 (“Extremely so”), with numbers as options in between. Mean spirituality was 3.37 ($SD = 1.72$), and mean religiosity 0.80 ($SD = 1.23$).

The participants were recruited through online advertisements and advertisements on email lists. Participants were not offered incentives for taking part. Ads for the survey were posted on psychedelics-related online forums; principally psychedelics-related sub-forums (“sub-reddits”) of www.reddit.com, and psychedelic forum The Shroomery. Three psychedelics-focused organisations also tweeted advertisements for the survey, and ads were placed on several psychology-related online sites such as the Social Psychology Network, and on other social media.

The project was reviewed and approved through the University’s formal research ethics procedure. Participants were required to read a participant information sheet and to declare their informed consent to participate. Given the socially undesirable nature of narcissism, participants were not informed of the exact nature of the personality measures in the survey prior to completing it. Following completion, participants were provided with a debrief that included an explanation of the main topic under research as well as providing information regarding sources of help relevant to the topics under study. All data were anonymous; no names, residential addresses, dates of birth, IP-addresses, or other information by which participants could be identified were collected.

2.2 Measures

Peak experience. All participants started by writing up, in a few sentences, their most awe-inspiring and significant experience of the past 5 years. If participants indicated they had used psychedelics drugs (psilocybin (magic mushrooms or truffles), LSD (acid), DMT, Ayahuasca, mescaline, peyote, 5-MeO-DMT, but not ketamine, salvia) in the past five years, then they (CSP users) were asked to pick their most awe-inspiring and significant experience under the influence of psychedelics (*italics phrase in square brackets included for these participants only*), and if they had not, to pick such an experience without being under the influence of psychedelics: “Please think of

your most awe-inspiring, impressive, significant, or emotionally intense experience [*while under the influence of psychedelics*] of the past 5 years". All participants then indicated how long ago the experience took place (years & months ago), how spiritual and how religious the experience was (from 0-4: 0 "Not at all", 1 "A little bit", 2 "Somewhat", 3 "Considerable", 4 "Very"), and in the case of the CSP users, which psychedelic drug the experience the result was of.

Awe Experience Scale (AWE-S). The AWE-S (Yaden et al. 2018) is a 30-item measure of awe. It has a six-factor structure comprising altered time perception, self-diminishment, connectedness, perceived vastness, physical sensations and need for accommodation. In the survey for the current study, the self-diminishment, connectedness, and perceived vastness subscales were used, resulting in a 15-item version of the measure. Examples of items in these subscales are, respectively, "I experienced a reduced sense of self"; "I had the sense of being connected to everything"; "I experienced something greater than myself". Participants were asked to indicate their agreement with these statements on a five-point Likert-type scale (-2 "Strongly Disagree", 1 "Disagree", 0 "Neither Agree nor Disagree", 1 "Agree", 2 "Strongly Agree") when thinking back to the experience they had just described. Together, the three subscales had good reliability, Cronbach's $\alpha = .89$, as did the connectedness and vastness subscales together (i.e., without the self-diminishment subscale), Cronbach's $\alpha = .88$. Separately, the subscales also had adequate reliability: self-diminishment, Cronbach's $\alpha = .86$, connectedness, Cronbach's $\alpha = .89$, perceived vastness, Cronbach's $\alpha = .82$. It was decided by the researchers after data collection but before data analysis for this article that the items of the self-diminishment subscale and the *Ego-Dissolution Inventory* (see below) were conceptually too close, and to avoid any potential overlapping of effects, awe experiences were calculated in this study as the average of the connectedness and perceived vastness AWE-S subscales.

Ego-Dissolution Inventory (EDI). The EDI (Nour et al. 2016) is an eight-item scale measuring the experience of a compromised sense of self, and is accompanied by an eight-item Ego-Inflation measure. Examples of items are, respectively: "I lost all sense of ego" and "I felt especially self-assured". Participants in this project responded to the items whilst thinking back to the experience they had just described using a five-point Likert scale as per the Awe Experience scale (again from -2 "Strongly Disagree" to 2 "Strongly Agree"), rather than the visual analogue scale employed by the EDI's developers. The EDI scale had adequate internal consistency in this sample (Cronbach's $\alpha = .81$), as did the ego inflation measure (Cronbach's $\alpha = .78$).

Empathy Components Questionnaire (ECQ). The 27-item ECQ (Batchelder et al. 2017) was developed to incorporate the aforementioned distinctions between drive and ability to engage in empathy, in addition to more classical distinctions between cognitive and affective empathy. It has a five-factor structure comprising affective empathetic drive, affective empathetic ability, cognitive empathetic drive, cognitive empathetic ability and affective empathetic reactivity. A 20-item version of the scale, excluding the affective reactivity sub-scale, was used for this study. Examples of the four subscales are: "I always try to consider the other fellow's feelings before I do something." (affective

drive); “Friends usually talk to me about their problems as they say that I am very understanding.” (affective ability); “I try to look at everybody's side of a disagreement before I make a decision.” (cognitive drive); “I am good at predicting what someone will do.” (cognitive ability). Participants responded to the items using a five-point scale (again, from -2 “Strongly Disagree” to 2 “Strongly Agree”), rather than the four-point scale used in the original version. In this sample, the scale showed good overall internal consistency, Cronbach’s $\alpha=.86$ (for the four subscales together), though two subscales individually performed slightly below the level of 0.7 conventionally seen indicating an acceptable level of reliability (Kline 2013) (affective drive, Cronbach’s $\alpha=.60$; cognitive drive, Cronbach’s $\alpha=.63$; cognitive ability, Cronbach’s $\alpha=.70$; affective ability, Cronbach’s $\alpha=.79$).

Connectedness. We used a five-point version of the Inclusion of Other in the Self Scale (IOSS; Aron et al. 1992), a pictorial measure of connectedness to others measured through a choice of increasingly overlapping circles. We adapted this scale for the present study to measure the currently experienced degree of connection felt to nature, humanity and the universe, respectively. The pictures were accompanied by the following instructions (taking the nature target as an example): “Please think now about how you currently perceive your relationship with ALL OF NATURE. Which of the following pictures best represents how you perceive your relationship to ALL OF NATURE” (for the pictures, see Figure ESM.1 in Online Resource). Scores ranged from no overlap (a score of ‘0’) to full overlap (a score of ‘4’). The scores for the three targets together approached adequate levels of internal consistency (Cronbach’s $\alpha=0.68$).

Narcissistic Personality Inventory 13 (NPI13). The NPI13 (Gentile et al. 2013) is a 13-item short-form of the NPI (Raskin and Terry 1988), which measures trait narcissism. It consists of forced-choice items, each one offering a narcissistic answer (e.g., “I expect a great deal from other people”), which is scored 1, and a non-narcissistic answer (e.g., “I like to do things for other people”), scored 0. The score on this scale is calculated by summing all answers. This measure was chosen over the more widely-used short-form version of the NPI, the NPI-16 (Ames et al. 2006), because the NPI-16 was designed as a unifactorial measure and has not been found to have a stable multifactorial structure, whereas the NPI13 was designed to reflect the three-factor structure of the NPI identified by Maxwell et al (2011). Its three subscales are *Entitlement-Exploitativeness* (EE), which was used as the study’s measure of maladaptive narcissism, *Grandiose-Exhibitionist* (GE) narcissism, and *Leadership-Authority* (LA) narcissism. Note that a survey error led item six (from the LA subscale) to be incorrectly worded, requiring responses to this item to be excluded. Analysis of the full NPI13 results was therefore conducted on a 12-item version, and of the LA sub-sale on a three- rather than four-item version. Gentile et al. (2013) found the NPI13 to have adequate consistency overall (Cronbach’s $\alpha=0.82$) and as regards its subscales (Cronbach’s $\alpha \geq .7$), with the exception of the EE-subscale (Cronbach’s $\alpha=.52$). They note that despite this, NPI-EE subscales nonetheless show evidence of good criterion validity, correlating with important external criteria. The overall scale as employed here showed poorer overall consistency than in previous studies, Cronbach’s $\alpha=.59$, falling below

conventional acceptability levels (Kline 2013). Subscales also performed more poorly: LA, Cronbach's $\alpha = .52$; GE, Cronbach's $\alpha = .62$; EE, Cronbach's $\alpha = .35$.

Brief Sensation Seeking Scale. The brief Sensation Seeking scale (Hoyle et al. 2002) is an eight-item short-form version of the 40-item Form V of the Sensation Seeking Scale. This scale was included in the survey as a control measure, as sensation seeking is both predictive of drug use (Jaffe and Archer 1987) and correlated with trait narcissism (Miller et al. 2009). Participants responded to the items using a five-point scale (again, from -2 "Strongly Disagree" to 2 "Strongly Agree"). In this sample the scale maintained acceptable internal consistency, Cronbach's $\alpha = .74$.

Demographics, spirituality and drug use questions. A set of questions about demographics, spirituality, and drugs was devised for the study, primarily for the purpose of measuring potential confounding variables. Participants were asked to provide demographic information – gender (male, female or other), country of residence and religious affiliation - and to indicate on seven-point scales ranging from 0 "not at all" to 7 "extremely so" how spiritual, and how religious, they considered themselves. The drug use element of this questionnaire was based broadly on the Demographics and Drug Use Questionnaire (Lyvers and Meester 2012), and asked participants who had taken CSPs in the past five years approximately how often they had taken the CSPs on a six-point scale ranging from 1 "rarely" to 2 "monthly", 3 "fortnightly", 4 "weekly", 5 "several times a week" and 6 "daily", and what typical dose they had taken on a five-point scale running from 1 "very low dose", to 2 "low dose", 3 "medium dose", 4 "high dose" and 5 "very high dose".

2.3 Preregistration

The hypothesised model was pre-registered (see: <https://osf.io/nmh74/>), together with the proposed hypotheses and analyses (see this link also for the survey materials). In this article, the same model, hypotheses, methods, and analyses have been used, except for the use of the control group in the mediation analyses. We only collected data from 104 non-CSP users and accordingly our study was underpowered to compare CSP to non-CSP awe experiences. As our main hypotheses were specific to the use of CSP (see Introduction), only conducted the analyses for the CSP group which are reported below.

3. Results

3.1 CSP use and narcissism

Figure 2: Correlation plot representing the correlations between narcissism subscales, AWE-S subscales, ego dissolution, ECQ subscales, and sensation seeking. All scores are standardized. NPIEEZ/NPIE= NPI Entitlement-Exploitativeness subscale; NPILAZ/NPIL= NPI Leadership-Authority subscale; NPIGEZ/NPIG= NPI Grandiose-Exhibitionist subscale; AweSelfZ/ASZ= AWE-S self-diminishment subscale; AweConnZ/ACZ= AWE-S connectedness subscale; AweVastZ/AVZ= AWE-S perceived vastness subscale; EgoDissZ/EDZ= EDI; ConnZ/CnZ=Connectedness; AffDrz/ADZ=ECQ Affective Drive; CognDrZ/CDZ=ECQ Cognitive Drive; SensSeekZ/SSZ= Brief sensation seeking scale.

First, we examined our relevant measures of narcissism and how they were associated with empathetic drive and ability, by plotting a correlational plot, see Figure 2. Next, we investigated these relationships further, using linear regressions, to verify that these were all as expected; see Table 1 (for overall narcissism and exploitative-entitled narcissism; see Table ESM.1 in Online Resource for leadership-authority and grandiose-exhibitionist narcissism regressions). In line with previous findings regarding narcissism and affective empathy (Urbonaviciute et al. 2017) and empathy drive (Hepper et al. 2014a), we found that, for all participants together, affective empathy drive (which combines the two) is the strongest predictor out of the four most basic ECQ sub-scales (affective drive, cognitive drive, cognitive ability and affective ability) of both overall NPI narcissism and the NPI EE subscale. Contrary to previous research, overall NPI is also – though to a smaller extent - significantly *positively* predicted by affective empathetic ability, and exploitative-entitled NPI significantly negatively predicted by cognitive empathetic drive. The latter finding suggests that it

may be overall drive to engage in empathy, rather than affective drive specifically or affective empathy more generally, that is related to maladaptive narcissism.

NPI total	β	95% CI	<i>t</i>	<i>p</i>	<i>fit</i>
Cognitive ability	<.01	[-.02, .20]	1.65	.10	$R^2 =$.055**, 95% CI = [.02, .09]
Cognitive drive	<-.01	[-.20, .01]	-1.70	.09	
Affective ability	.18	[.06, .29]	3.03	.002	
Affective drive	-.19	[-.30, -.09]	-3.59	<.001	
NPI - EE	β	95% CI	<i>t</i>	<i>p</i>	<i>fit</i>
Cognitive ability	<.01	[-.02, .20]	1.63	.10	$R^2 =$.053**, 95% CI = [.02, .09]
Cognitive drive	-.11	[-.21, <-.01]	-2.02	.04	
Affective ability	<-.01	[-.12, .11]	-.08	.94	
Affective drive	-.18	[-.28, -.07]	-3.32	<.001	

*Table 1: Regressions of the components of the ECQ (cognitive empathetic ability/drive & affective empathetic ability drive) on overall narcissism (NPI total) and exploitative-entitled narcissism (NPI EE). * $p < .05$, ** $p < .01$, *** $p < .001$.*

In terms of connectedness, we ran a regression model predicting exploitative-entitled narcissism by the three measures of connectedness that together make up our measure of ‘current levels of connectedness’ and found that it was connectedness to nature ($b = -.12$, 95% CI [-.23, -.01], $p = .03$) and connectedness to humanity ($b = -.14$, 95% CI [-.25, -.04], $p = .007$), but not connectedness to the universe ($b = .05$, 95% CI [-.06, .15], $p = .38$) that predicted lower levels of exploitative-entitled narcissism (overall model $R^2 = .04^{**}$, 95% CI = [.01, .08])(see Table ESM.2 Online Resource for an overview of correlations between NPI total and subscales and the connectedness measures).

Next, we ran a correlation of sensation seeking with overall NPI and NPI EE for the whole participant sample and found that, as expected, sensation seeking was positively and significantly correlated with overall NPI ($r = .26$, 95% CI [.18, .34], $p < .001$) and NPI GE ($r = .33$, 95% CI [.25, .40],

$p < .001$), but not NPI EE ($r = .04$, 95% CI $[-.05, .12]$, $p = .38$) or NPI LA ($r = .06$, 95% CI $[-.02, .15]$, $p = .15$).

Within the CSP users group, we investigated whether NPI EE, our main narcissism measure of interest, was significantly affected by age, gender, and sensation seeking. We found that NPI EE scores did not differ significantly between the genders (male, $M = .49$, $SD = .77$, female, $M = .48$, $SD = .69$, other, $M = .69$, $SD = .85$, $F(1,411) = .47$, $p = .63$, $\eta_p^2 = .002$), but that it was significantly correlated with age ($r = -.10$, 95% CI $[-.20, -.01]$, $p = .04$) and sensation-seeking ($r = .11$, 95% CI $[-.01, .20]$, $p = .03$). Unsurprisingly, age and sensation-seeking correlated significantly with each other, as well ($r = -.37$, 95% CI $[-.45, -.28]$, $p < .001$), with younger adults scoring higher on sensation-seeking than older adults. When running partial correlations however, we found that the effects of age and sensation-seeking on NPI EE partially cancelled each other out: when controlling for sensation-seeking, the partial correlation between NPI EE and age was $r = .07$, $p = .18$; when controlling for age, the partial correlation between NPI EE and sensation-seeking was $r = .08$, $p = .12$. Given our *a priori* hypotheses about the role of sensation seeking in CSP use and narcissism, we retained sensation-seeking as a control variable for subsequent analyses.

For CSP users only, when examining the different drugs that the CSP users took for their experience, we found no differences in the experience of awe ($F(6,386) = 1.13$, $p = .35$, $\eta_p^2 = .02$) or ego dissolution ($F(6,386) = 1.19$, $p = .31$, $\eta_p^2 = .02$) as a result of the drug they took (see Table ESM.3 in Online Resource for estimated marginal means).

3.2 Awe, ego dissolution, connectedness, and empathy

Our main research question was whether CSP ‘trips’ lead to experiences of awe and ego dissolution, and whether this is associated with reduced levels of maladaptive narcissism through increased feelings of connectedness and affective empathetic drive. We ran a multiple mediation model to test this; see Figure 3 (and Table ESM.4 in Online Resource for the full statistics). The mediation model included two predictor variables (awe experience & ego dissolution), two mediators (connectedness & affective empathetic drive), one outcome (exploitative-entitled narcissism), and one control variable (sensation-seeking). The model was run on standardized variables and was bootstrapped ($n = 5000$). Importantly, there were two significant indirect effects: from experiencing awe during the CSP trip to currently reduced maladaptive narcissism via currently increased feelings of connectedness ($b = -.03$, $p = .05$, orange line in Figure 3), and from experiencing awe during the CSP trip to currently reduced maladaptive narcissism via currently increased affective empathetic drive ($b = -.04$, $p = .01$, turquoise line in Figure 3). These two indirect pathways were not significantly different from each other ($b = .01$, $p = .53$). Neither indirect pathway from experiencing ego dissolution during the CSP trip to currently reduced maladaptive narcissism via connectedness and affective empathetic drive were significant ($b = -.01$, $p = .20$, green line and $b < -.01$, $p = .57$, purple line in Figure 3, respectively).

Figure 3: Multiple mediation model from the experiences of awe and ego dissolution to exploitative-entitled narcissism via connectedness and affective empathetic drive in CSP users, with sensation-seeking as a control variable. Four colours (orange, green, turquoise, and purple) represent indirect effects. Numbers represent standardised beta values. * $p < .05$, ** $p < .01$, *** $p < .001$.

Following up on this mediation model, we examined whether it mattered how long ago the CSP trip took place, since our measures of the experience of awe and ego dissolution refer to the experienced CSP trip, whereas the measures of connectedness and affective empathetic drive (as well as narcissism and sensation-seeking) refer to current levels. To this end, we ran two regressions with moderators where we measured the effect of time having passed since the trip on the relationship between the awe experience and affective empathetic drive and connectedness, and found that the moderation effect was not significant in either case (affective empathetic drive by how long ago the CSP trip was, $b < .01$, $p = .20$, connectedness by how long ago the CSP trip was, $b < .001$, $p = .78$).

Next, we checked whether the frequency of taking CSPs, or the size of a typical dose, influenced the effect of the awe experience on affective empathetic drive and connectedness. First, we ran two ANOVAs to investigate whether levels of affective empathetic drive and connectedness differed between participants depending on their intake frequency. We found that the frequency of taking CSPs did not affect current levels of affective empathetic drive ($F(5,403) = .72$, $p = .61$, $\eta^2 = .009$) or connectedness ($F(5,403) = 1.18$, $p = .32$, $\eta^2 = .01$), nor did the typical dose of CSPs affect current levels of affective empathetic drive ($F(4,404) = .62$, $p = .64$, $\eta^2 = .006$) or connectedness ($F(4,404) = 2.08$, $p = .08$, $\eta^2 = .02$). To make sure there was no effect on the indirect pathways from awe experiences to narcissism, we ran additional moderator analyses and found that frequency of taking CSPs in the past 5 years also did not significantly influence the relationship between the awe

experience and affective empathetic drive ($b = .08, p = .12$) or connectedness ($b = .03, p = .53$), nor did the typical dose of CSPs influence either affective empathetic drive ($b = .01, p = .80$) or connectedness ($b = -.03, p = .58$).

Finally, we explored what it is about awe that might drive the positive effect on both affective empathetic drive and connectedness that in turn is related to decreased maladaptive narcissism. We ran two regressions to investigate which of the awe subscales was most strongly related to this effect. We found that affective empathetic drive is significantly predicted by the connectedness subscale of AWE-S ($b = .28, 95\% \text{ CI } [.17, .39], p < .001$), and not the perceived vastness subscale ($b = -.02, 95\% \text{ CI } [-.13, .09], p = .70$) in an overall significant model ($R^2 = .072^{**}, 95\% \text{ CI } = [.03, .12]$). This was also the case for our IOSS connectedness measure (AWE-S connectedness ($b = .25, 95\% \text{ CI } [.14, .35], p < .001$), AWE-S perceived vastness ($b = .07, 95\% \text{ CI } [-.04, .18], p = .19$) in an overall significant model ($R^2 = .084^{**}, 95\% \text{ CI } = [.04, .14]$). This driving effect of AWE-S connectedness on empathy and felt connectedness held if the self-diminishment subscale of the AWE-S was also included in the regression (see Table ESM.5 in Online Resource). An additional exploratory analysis demonstrated that AWE-S connectedness experienced during the CSP trip was in turn significantly correlated with the extent to which participants perceived the trip to be a spiritual experience ($r = .51, p < .001$) and a religious experience ($r = .27, p < .001$).

4. Discussion

This study investigated a hypothesised (negative) relationship between psychedelic use and maladaptive narcissism. We expected that psychedelic-occasioned experiences of awe and ego dissolution would be related to lower narcissism, mediated by increased empathetic affective drive and feelings of connectedness. Our main finding is that feelings of awe, but not ego dissolution, during recent CSP experiences were associated with increased feelings of connectedness and empathy, which in turn were associated with decreased levels of maladaptive narcissism. These findings indicate that psychedelics can positively affect narcissistic personality traits, through their awe-inducing potential.

Specifically, we found that affective empathy drive is the strongest predictor (out of four facets of empathy) of both overall narcissistic personality and exploitative-entitled narcissism. These findings are in line with previous research showing that the relationship between empathy and narcissism is driven by the emotional facet of empathy (Urbonaviciute et al. 2017; Wai and Tiliopoulos 2012), via their relationship with maladaptive facets of narcissism in particular. Our findings also corroborate research showing that narcissists appear to lack the drive rather than the ability to engage in empathy (Hepper et al. 2014b), with similar findings for other empathy-related traits and psychological disorders such as psychopathy (Meffert et al. 2013).

In this study, awe was measured by two subscales of the Awe Experience Scale (AWE-S; Yaden et al. 2018): connectedness and perceived vastness. Measures of affective empathetic drive and connectedness (to nature, humanity, and the universe) were significantly predicted by AWE-S connectedness over AWE-S perceived vastness and AWE-S self-diminishment. This finding is in line with other recent research showing correlations between measures of (social and nature-related) connectedness and feelings of oneness, and empathy (Edinger-Schons 2019; Zhang et al. 2014). The observation that awe-related feelings of connectedness also predict -via empathy and enduring feelings of connectedness - lower narcissism, is also in line with other recent research showing that increased empathy mediates the negative relationship between connectedness (here nature-relatedness specifically) and psychopathy (Fido and Richardson 2019). It also supports the previously noted suggestion that (a lack of) connectedness to others may be central to narcissism (Twenge and Campbell 2009), but also points to the importance of connectedness to other elements of existence external to the self (especially nature).

Moreover, an exploratory analysis showed that AWE-S connectedness experienced during the CSP trip was significantly and positively correlated with perceived spirituality and religiousness of the trip. This corroborates previous findings of positive relationships between spirituality and nature connectedness (Trigwell et al. 2014) and that spirituality as a construct can be conceptualised as emotional connectedness not only to the divine, but also to nature and other people (Johnstone et al. 2012). We found that specifically connectedness to nature and humanity rather than connectedness to the universe predicted lower levels of exploitative-entitled narcissism in psychedelics users. This might result from the more abstract nature of the notion of connectedness to the universe compared to the other two scales, and is in line with other research suggesting a link between psychedelics and increases in relatedness or connectedness to nature (Lyons and Carhart-Harris 2018).

The finding that AWE-S connectedness rather than ego-dissolution predicted affective empathetic drive and enduring feelings of connectedness was counter to our hypothesis. In our study the AWE-S self-diminishment sub-scale also turned out not to be a significant predictor of the model, while the connectedness sub-scale was positively associated with empathy. These findings make sense in light of the theoretical suggestion that awe may constitute the primary mechanism of action underlying psychedelic drugs' therapeutic effects, by fostering stronger feelings of connection to others and the environment (Hendricks, 2018).

A limitation of this study is that it is a cross-sectional rather than longitudinal study. As such, we cannot draw any causal inferences regarding the effects of psychedelics on narcissistic personality traits. Moreover, we had to rely on participants' recall of their experience. We asked for their peak (psychedelic) experience of the past five years, which is likely significant enough to be well-memorised. When we checked in follow-up analyses, we found that the amount of time having passed since the experience, the frequency of taking classic serotonergic psychedelic drugs, nor the size of a typical dose had an effect on the relationship between the awe experience and affective empathetic

drive and connectedness. This suggests that the effects of a highly significant psychedelic experience can have enduring effects.

Since the publication Griffiths et al.'s (2006) study demonstrating psilocybin's ability to occasion mystical experiences that have lasting positive effects, there has been a renaissance of such experimental research, accompanied by an increase in observational and epidemiological research interest. There are many potential advantages to using psychedelic drugs in both research and mental health settings: many of these psychedelic drugs have low toxicity (Nichols 2004), are not habit-forming (Nichols 2004), and reliably induce peak experiences (Nichols 2016), even in laboratory settings (Turton et al. 2014). Moreover, while the actual psychedelic experiences are relatively brief, the duration of the effects can persist for months or years (Griffiths et al. 2008; MacLean et al. 2011). While the current study was a cross-sectional survey study, its findings encourage future research on psychedelics and maladaptive narcissism involving experimental and longitudinal settings. An additional topic that could be investigated in future research is the involvement of the brain's so-called default mode network: Neuroimaging research has shown that psilocybin reduces activity in the brain's default mode network (Carhart-Harris et al. 2012) and higher activation of the DMN has been hypothesised to increase narcissism (Jankowiak-Siuda and Zajkowski 2013). It could thus be determined whether psychedelic experiences result in lasting changes in DMN network activity or connectivity, which in turn could be related to a reduced focus on self-focused processing.

This cross-sectional survey study showed that classic serotonergic psychedelic drugs can have positive effects on feelings of connectedness and affective empathetic drive, and through these mechanisms may reduce maladaptive narcissism. Furthermore, while the narcissism scale employed in the current study, the Narcissistic Personality Inventory (Gentile et al. 2013; Raskin and Terry 1988), is a measure of a personality trait rather than a clinical measure of mental illness, together with previous research, this study adds to the idea that classic serotonergic psychedelic drugs may be associated with substantial, enduring and often positive effects on wide-ranging aspects of both mental health and personality.

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