

## Psychedelics and connectedness

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**Abstract** Psychedelic drugs are creating ripples in psychiatry as evidence accumulates of their therapeutic potential. An important question remains unresolved however: *how* are psychedelics effective? We propose that a sense of *connectedness* is key, provide some preliminary evidence to support this, and suggest a roadmap for testing it further.

We are in the midst of a cultural zeitgeist with regard to psychedelic drugs such as psilocybin, LSD and DMT (ayahuasca) (Carhart-Harris and Goodwin 2017). April 2017 featured the largest ever conference on the topic, ‘Psychedelic Science’, in Oakland, California, attended by 3000 people from over 40 different countries. Among the 175+ speakers were Tom Insel (former director of the National Institute for Mental Health) and Paul Summergrad (past president of the American Psychiatric Association), speaking enthusiastically and encouragingly about the field, symbolic in some sense of its present ‘main-streaming’ (Carhart-Harris and Goodwin 2017).

The theme of *connectedness* was pervasive at *Psychedelic Science*, featuring consistently among speakers’ presentations. To our knowledge, the concept was first given clear emphasis in psychedelic therapy by Watts et al. 2017, in a qualitative research paper linked to our recent psilocybin for treatment-resistant depression (TRD) clinical trial (Carhart-Harris et al. 2016)—see also (Belser et al. 2017). In 6-month follow-up interviews, participants were asked: ‘Did this treatment work

for you, and if so how?’ and responses were analysed for consistent themes (Watts et al. 2017). Of the 17 patients who endorsed the treatment’s effectiveness, *all* made reference to one particular mediating factor: a renewed sense of *connection* or *connectedness*. This factor was found to have three distinguishable aspects: connection to (1) *self*, (2) *others* and (3) *the world* in general (Watts et al. 2017). For many, the sense of connectedness featured acutely, during the treatment session itself, but just as commonly, it endured for several weeks to months afterwards, as can be seen here from a participant who remained in remission for 3-months post-treatment:

*‘This connection, it’s just a lovely feeling... this sense of connectedness, we are all interconnected.’* (male, aged 52)

A sense of *disconnection* is a feature of many major psychiatric disorders, particularly depression (Karp 2017), and a sense of connection or *connectedness* is considered a key mediator of psychological well-being (Cervinka et al. 2012; Lee et al. 2008), as well as a factor underlying recovery of mental health (Leamy et al. 2011). One of the most curious aspects of the growing literature on the therapeutic potential of psychedelics is the seeming *general* nature of their therapeutic applicability (Carhart-Harris and Goodwin 2017), i.e. they have shown promise not just for the treatment of depression but for addictions, anxiety and obsessive-compulsive disorder (Carhart-Harris and Goodwin 2017). This raises the question of whether psychedelic therapy targets a *core factor* underlying mental health. We believe that it does, and that *connectedness* is the key (Watts et al. 2017).

Like any construct in psychology, *connectedness* requires validation work. Validated measures of ‘social connectedness’ (Lee and Robbins 1995) and ‘connectedness to nature’ (Mayer and Frantz 2004) already exist. We recently showed

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that feelings of connectedness to nature are increased post-psylocybin (Lyons et al. 2017, under review)—and see also (Forstmann and Sagioglou 2017)—and correlate with the extent of past psychedelic drug-use and intensity of ‘ego-dissolution’ experienced under a psychedelic (Nour et al. 2017). There already exist ample behavioural indices of connection

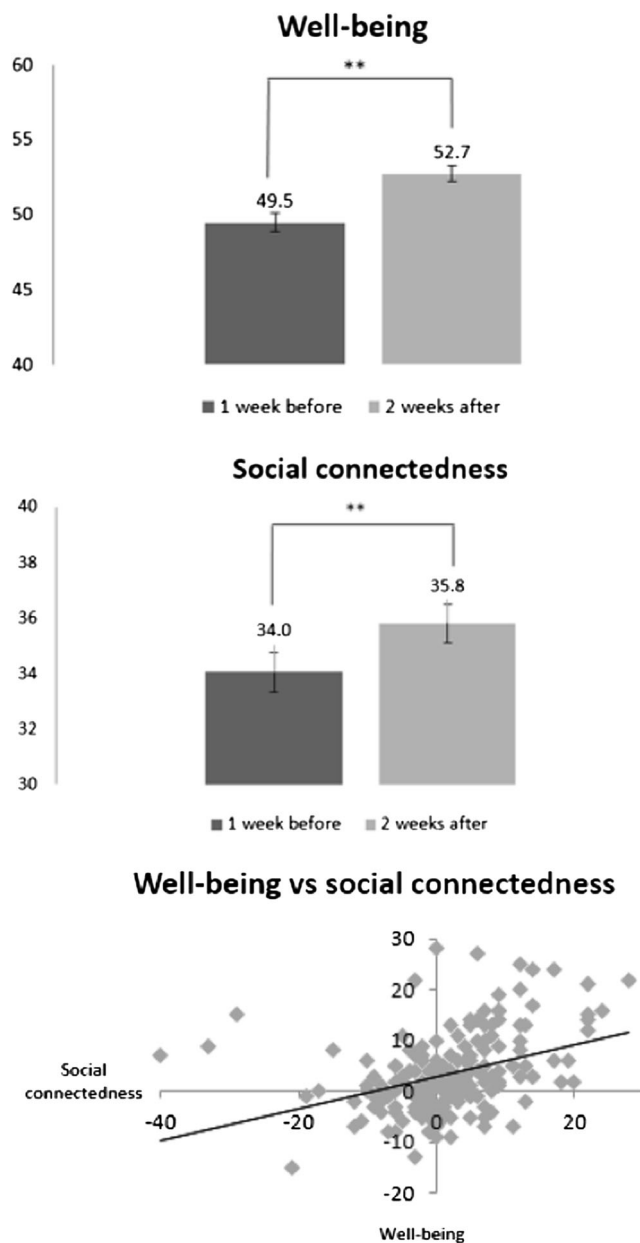
to ‘others’ and ‘world’ in various guises, and new measures could be easily devised and developed.

We are presently collecting longitudinal data on social connectedness in individuals who plan a psychedelic experience and provide web-based survey data on the process. Figure 1 displays some relevant preliminary data from this project, showing increased social connectedness and psychological well-being 2 weeks after an experience, plus the significant positive relationship between them. These data were collected from a sample of over 200 people. Future work, featuring mediation modelling could determine whether aspects of the acute psychedelic experience such as ‘ego-dissolution’ (Nour et al. 2016), ‘mystical experience’ (Barrett et al. 2015) and ‘awe’ (Piff et al. 2015) mediate the long-term positive effects of psychedelics and whether increased connectedness is a principal component of post-psychedelic therapeutic change—as we suspect (Watts et al. 2017).

As noted above, *connectedness*, as it was described by patients in our TRD trial, encompassed not just connection to others (i.e. social connectedness) and the world in general (e.g. *connectedness* to nature) but also connection to *the self* (Watts et al. 2017). Post-treatment, participants referred to feeling reconnected to past values, pleasures and hobbies as well as feeling more integrated, embodied and at peace with themselves and their often troubled backgrounds. It is a working hypothesis of ours that *connection-to-self* is a bedrock from which connection to others and the world can follow most naturally. Another hypothesis is that positive therapeutic outcomes could be jeopardised if the primary *connection-to-self* stage is leap-frogged, e.g. due to incomplete psychological integration (Richards 2015).

*‘Yesterday I was clever, so I wanted to change the world.  
Today I am wise, so I am changing myself.’* (Jalaluddin Rumi)

A relevant scale for measuring *connection-to-self* might be the ‘quiet ego scale’ (Wayment et al. 2015). However, we feel there is much scope for a new *connectedness* scale that can incorporate the three sub-factors identified in our recent qualitative analysis (Watts et al. 2017), namely *connection-to-self*, *others* and *world* in general. The scales mentioned above could serve as tools to test convergent validity; measures of well-being and psychiatric symptoms could serve as tests of clinical usefulness and comparator drugs could be incorporated to test the hypothesis that there is a selective relationship between psychedelics and *connectedness* that does not exist for other psychoactive drugs such as alcohol (chronic and excessive use especially), stimulants and conventional psychiatric medications such as the selective serotonin reuptake inhibitors (SSRIs). It is notable in this regard that many patients in our TRD trial felt that the process and effect of being prescribed conventional treatments merely reinforced their sense



**Fig. 1** Measures collected before and 2 weeks after a planned psychedelic drug experience, as part of a longitudinal web-based survey project that will be reported on in detail in future publications (<https://www.psychedelicsurvey.com>). Well-being was measured with the Warwick Edinburgh Well-being Scale (Tennant et al. 2007) and scores range from 14 to 70; social connectedness was measured with the Social Connectedness Scale (Lee and Robbins 1995) and scores range from 8 to 48. Significant increases in both measures were seen post-psychedelic ( $n = 204$ ,  $**p < 0.01$ , paired  $t$  test), and there was a significant positive relationship between their respective change scores ( $r = 0.387$ ,  $p < 0.01$ )

of disconnection (Watts et al. 2017). Moreover, stimulant use has been associated with hubris and individualism and alcohol use with a lack of concern for nature and the environment (Nour et al. 2017).

We are mindful of the scientifically delicate association between psychedelics and ‘mystical experience’. Despite previously expressed concerns regarding this construct (Carhart-Harris and Goodwin 2017), psychedelic-induced mystical experiences have been found to predict long-term increases in psychological well-being (Griffiths et al. 2006) as well as clinical improvements after psychedelic therapy (Carhart-Harris and Goodwin 2017). Given the apparent positive mediational value of such experiences, it seems pertinent to better understand *where* their value lies, and again, we suspect that *connectedness* may be the key.

Writing in 1960, philosopher Walter Stace referred to the ‘unitive experience’ (a sense of ‘oneness’ or ‘unity’) as *the* core hallmark of the mystical experience. Items pertaining to a sense of ‘oneness’ form a major part of leading measures of mystical experience, including the recently validated ‘mystical experience questionnaire (MEQ)’ (Barrett et al. 2015). The unitive experience is closely related to the construct of *connectedness*. We recently found that scores of psychedelic-induced *unitive experience* correlate highly with scores of ‘ego-dissolution’ (Nour et al. 2016). Conceptually, one can consider the ego as a counter-force to *connectedness*. Consider for example, an item from our recently developed ‘ego-inflation’ measure, scores on which correlated positively with cocaine-use and negatively with psychedelic-use (Nour et al. 2016): ‘*I felt more important or special than others*’. Note how this contrasts with items from the following: (1) our ‘ego-dissolution inventory’ or EDI (Nour et al. 2016): ‘*I felt far less absorbed by my own issues and concerns*’; (2) the MEQ: ‘*Freedom from the limitations of your personal self and feeling a unity or bond with what was felt to be greater than your personal self*’; (3) the *connectedness to nature scale* (Mayer and Frantz 2004): ‘*I often feel a sense of oneness with the natural world around me*’ and a ‘small self’ measure used in research on ‘awe’: ‘*I feel the presence of something greater than myself*’ (Piff et al. 2015).

Part of our focus within the Psychedelic Research Group at Imperial College London has been to better understand the brain mechanisms of psychedelics, including their putative therapeutic actions, and while brain imaging adds a perceived sophistication to psychedelic research, psychological mechanisms are at least as important—offering a level of explanation that is closer to the lived-experience, broadly accessible and also potentially most useful, e.g. in terms of *cost-effectively* predicting treatment effectiveness (Carrillo et al. 2017). Human brain imaging’s special appeal lies in its ability to ‘open the black box’—revealing insights about major unknowns—but imaging findings can also be misused, e.g. in terms of excessive reverse inference (Poldrack 2006) and ‘neuro-realism’ (Racine et al. 2010). Even so, we recognise

that the healthy *demystification* process that is presently taking place in psychedelic research relies in no small part on the identification of biological substrates of high-level subjective experiences, and we have no doubt that both an acute and enduring sense of *connectedness* have identifiable biological substrates.

Our work on the neural correlates of ‘ego-dissolution’ may be considered part of a progressive initiative to demystify the psychedelic experience (Tagliazucchi et al. 2016; Nour et al. 2016). Like ego-dissolution and ‘entropy’ (Carhart-Harris et al. 2014), *connectedness* is particularly appealing as a construct because it carries meaning in both *mechanistic* and subjective sense. Our finding of increased global functional connectivity in the ‘psychedelic brain’ and its relationship to ego-dissolution (Tagliazucchi et al. 2016) may be considered a candidate neural correlate of the *unitive experience*—i.e. *connectedness* in its acute form. How this relates to longer-term feelings of *connectedness*, however, is perhaps a more challenging question. Does the unitive experience leave a lasting memory trace, analogous to ‘the overview effect’ experienced by some astronauts (White 1987)—characterised by a sense of ‘awe’ and perceived smallness in the presence of vastness (Piff et al. 2015) or does the psychedelic experiences cause lasting anatomical and/or functional brain changes? These possibilities need not be mutually exclusive, and only properly supported empirical research can advance and eventually resolve these matters. We hope that mainstream funding bodies be broadminded and brave enough to see the possibilities here, as the potential rewards for science and society may be great.

Finally, it seems remarkable that we can discuss high-level constructs such as ‘connectedness’ while knowing psychedelics’ action at the molecular level. For example, we know that psychedelics initiate their signature subjective effects via serotonin 2A-receptor agonism (Carhart-Harris and Nutt 2017). Since psychedelics ‘hijack’ an existing system, it is natural to ask what evolutionary role that system has played throughout our species’ development—and whether understanding this may shed light on our understanding of the functioning of brain serotonin more generally. Relevant questions have recently been explored (Carhart-Harris and Nutt 2017). In brief, we have proposed that brain serotonin 2A receptor signalling mediates a state of rapid plasticity that is conducive to major change (e.g. in outlook and/or behaviour)—when such change feels necessary (e.g. to aid mental or physical survival). Such a function may be related to humans’ unique capacity for adaptability.

Moving forward, we intend to develop an operational definition of *connectedness* that incorporates not just *connectedness* in the subjective sense but also its biological basis and various behavioural manifestations. Crucially, such a definition should be meaningful and useful not just in the context of psychedelics—but universally.

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**Compliance with ethical standards**

**Conflicts of interest** The authors declare that they have no conflicts of interest.

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