

Naturalistic Psilocybin Use Increases Mind Perception but not Atheist-Believer status: A Prospective Longitudinal Study

Sandeep M. Nayak¹, Sydney H. White¹, Samantha N. Hilbert¹, Matthew X. Lowe², Heather Jackson², Roland R. Griffiths^{1,3}, Albert Garcia-Romeu¹, David B. Yaden¹

¹Center for Psychedelic and Consciousness Research, Department of Psychiatry and Behavioral Sciences, Johns Hopkins University School of Medicine.

²Unlimited Sciences.

³The Solomon H Snyder Department of Neuroscience, Johns Hopkins University School of Medicine.

Corresponding Author:

Sandeep M. Nayak, MD

Behavioral Pharmacology Research Unit

Center for Psychedelic and Consciousness Research

Johns Hopkins University School of Medicine

5510 Nathan Shock Drive

Baltimore, MD 21224

smn@jhmi.edu

Conflict of interest statement

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Abstract

Recent studies suggest psychedelic use may be associated with changes in a variety of beliefs or belief-like states, including increased 1) mind perception, 2) non-naturalistic beliefs, and 3) Atheist-Believer status (e.g., believer, agnostic, or non-believer). We conducted a prospective longitudinal study among participants (N = 657) who planned to have a psychedelic experience. We asked participants about their beliefs concerning mind perception of various entities, specific metaphysical positions, and Atheist-Believer status both before and after their experience. Replicating previous findings, we observed increases in mind perception across a variety of living and non-living targets (e.g., plants, animals). However, we found little to no change in metaphysical beliefs (e.g., dualism) or Atheist-Believer status. Taken together, these findings contrast with those from cross-sectional studies that psychedelic experiences result in changes to Atheist-Believer status and non-naturalistic beliefs but support the relevance of mind perception and mentalization.

Introduction

Psilocybin is a psychedelic substance that has been used for at least centuries in ritual settings that could be considered broadly religious or shamanic (Schultes, 1976). Psychedelics have often been associated with spiritual beliefs and practices in contemporary cultures (Hartogsohn, 2020). Most such beliefs fall into the category of non-naturalistic beliefs (Yaden et al., 2021), which refer to propositional claims about the nature of reality that posit a non-physical mind (e.g., a soul), realm (e.g., heaven), or any other referents beyond physical reality (see Bloom, 2007; Letheby, 2021). In the context of contemporary medical research settings, some have discussed whether or not religious/spiritual/non-naturalist belief changes reliably occur after psychedelic experiences (Jacobs, 2020; Johnson & Yaden, 2020). Others have discussed the possible mechanisms of belief changes (McGovern, Leptourgos, Hutchinson, & Corlett, 2022; Nayak et al. 2022; Timmermann et al., 2021). While preliminary data has been reported on this topic, which we review below, the magnitude and specifics of such purported belief changes are not known.

Several studies provide preliminary evidence for metaphysical belief changes in the context of psychedelic research. Cross-sectional retrospective survey studies have found decreased identification as atheist (Davis et al., 2020; Griffiths et al., 2019) and increased spirituality (Yaden et al., 2017; Griffiths et al., 2019; Sweeney et al., 2022) after psychedelic experiences. However, these studies suffer from selection bias (i.e., the surveys may have attracted those who are more likely to report religious/spiritual content). Several controlled randomized trials with psilocybin have found that most participants attribute a great deal of spiritual significance to the acute subjective effects of psilocybin (e.g., Griffiths et al., 2006; 2011; 2016; 2018; Davis et al., 2021), although belief changes after psychedelic experiences were not directly assessed in these trials.

Evidence from a prospective survey in a ceremonial context and a randomized clinical trial found that metaphysical beliefs shifted towards non-naturalism (referred to as non-physicalist beliefs and measured with a metaphysical beliefs questionnaire; Timmermann et al., 2021). In the prospective survey component, participants were recruited who planned to attend a ceremony involving a psychedelic substance. Beliefs such as materialism, panpsychism, and dualism were assessed in the metaphysical beliefs questionnaire (e.g., “There exists another separate realm or dimension beyond this physical world that can be experienced or visited”). Increases in this measure were observed from baseline to 4 weeks ($d = .33$) and 6 months ($d = .46$) after the psychedelic experience. In the randomized controlled trial comparing psilocybin to SSRI, the psilocybin group endorsed increased non-naturalistic beliefs on the metaphysical beliefs questionnaire after their psychedelic experiences from baseline to 6-weeks ($d = .45$). However, the SSRI group also nominally (but not significantly) increased in their non-physicalist beliefs ($d = .2$) and a direct comparison between groups on this measure was not reported, restricting what inferences can be drawn regarding this finding. Additionally, the lack of effective blinding in this clinical trial means that participants’ cultural expectations and associations with psychedelics, which likely tend to lean spiritual and thus non-naturalistic in contemporary culture (Hartogsohn, 2020), could help explain the findings.

A more recent retrospective survey study (Nayak and Griffiths, 2022; Nayak et al., 2022) examined the various types of metaphysical beliefs that might change in more granular detail. A factor analysis of metaphysical belief items resulted in five factors: dualism, paranormal/spirituality, non-mammal consciousness, mammal consciousness, and superstition. The mammal and non-mammal consciousness items relate to mind perception (Gray, Gray, & Wegner, 2007), which involves the attribution of the capacity for agency (decision-making) and experience (feeling, e.g., pleasure and pain), although in this study participants were asked to simply rate how conscious a variety of entities seem (e.g., plants, animals, humans, universe). The metaphysical belief items related to dualism, spirituality, and superstition were created by the researchers and come from measures such as: the Mind-Body Relationship Scale (Riecki et al., 2013), the Metaphysical Beliefs Questionnaire (Timmermann et al., 2021), the Paranormal Belief Scale (Tobacyk, 2004). The Atheist-Believer item (Griffiths et al., 2019) asked participants whether they consider themselves a “believer”, “agnostic”, or “non-believer.” Participants in this study endorsed persisting increases from a psychedelic experience in dualism, paranormal/spirituality, non-mammal consciousness, mammal consciousness, but not superstition (e.g., “breaking a mirror brings bad luck”). Additionally, this survey found that 36% of the participants reported being a “non-believer (e.g., atheist)” at baseline, and only 13% reported being a non-believer at after their experience. However, this study was advertised as a “belief change” survey, which may introduce a substantial selection bias.

Belief changes in the context of psychedelic experiences raise bioethical questions. Adequate informed consent should require transparently informing participants of the possibility of such changes in worldview (Smith & Sisti, 2021). Such findings also underscore the importance of careful consideration of pairing such interventions with

religious/spiritual content of any kind (Johnson, 2020; Yaden et al., 2022), and raise questions about how clinicians should help participants to integrate such changes, with important prohibitions against undue influence from clinicians (Yaden, Nayak, & Griffiths, in press).

The magnitude and persistence of these belief changes matter. Both Timmermann et al. (2021) and Nayak et al. (2022) found small, moderate, and large effects in the direction of non-naturalism depending on the specific measure. However, there may have been methodological problems with both of these studies that make it difficult to draw conclusions regarding the type, magnitude, and persistence of potential metaphysical belief changes associated with psychedelic experiences.

In this study, we collected data from a large sample of participants who reported that they were planning to undergo a psychedelic experience. We collected data before their experience, a few weeks after their experiences, and a few months after their experiences. We included measures of metaphysical belief change (e.g., dualism), mind perception to various targets (e.g., plants, insects, mammals), and religious affiliation (i.e., non-believer, agnostic, believer).

Methods

This prospective longitudinal study recruited participants who indicated that they were planning to have a psychedelic experience in the near future. Recruitment was handled by a non-profit organization interested in providing ecologically valid data regarding psychedelic use.

Participants were recruited using online advertisements. The advertisements indicated that participants were being sought to gain more information regarding the so-called “set and setting” of psychedelic use. Notably, this advertisement did *not* mention belief changes or beliefs in any way. Specifically, the main information page related to study recruitment read:

“By collecting data from more than 1,000 individuals, 18 years and older, who are already planning to use psilocybin, we aim to investigate variables such as demographics, lifestyle, mindset, and personality traits. Additionally, we want to know more about the characteristics of the experience itself such as dosage, ingestion method, intention, guidance, and setting—all of which could influence psilocybin’s short- and long-term effects.”

The Institutional Review Board approved all study procedures.

The survey included questions about demographics, specifics about psychedelic use (e.g., dosage), the setting in which the psychedelic experience occurred, and a variety of well-being related and therapeutic outcomes that will be reported elsewhere.

Measures

Items related to three sets of questions: 1) metaphysical beliefs, 2) mind perception (e.g., mammals, non-mammals), and 3) Atheist-Believer status were administered. These measures were added into the ongoing study at different times, resulting in varying sample sizes between these sets of questions. We restricted analysis to participants who provided both baseline and follow-up data for a given set of questions.

Mind Perception.

This measure consists of ten items which measure beliefs about the ability of various targets to have conscious experience (Nayak and Griffiths, 2022). These targets include four species of mammals, five non-mammal objects/entities, and one item about the universe as a whole. The measure uses a seven-point Likert scale ranging from -3 (strongly disagree) to +3 (strongly agree). Some example items include “I (the person taking the survey right now) am capable of having conscious experience”, “Plants (e.g., trees, flowers) are capable of having conscious experience”, and “The universe is conscious”. Full text of all items is available in Table 1. Cronbach’s alpha for all 10 items is 0.87. This measure was collected at the following timepoints: 2-weeks before the session, 2-4 weeks after, and 2-3 months after.

Metaphysical beliefs.

These items are a collection of four questions pertaining to beliefs about materialism, dualism, idealism, and determinism. The language of the dualism item was a slightly modified version of an item from the Metaphysical Beliefs Questionnaire (MBQ) in Timmermann et al. (2021). The materialism and idealism items are from Nayak et al. (2022), which were originally modified from Timmermann et al. (2021) as well. The fourth item relating to determinism was used in Nayak et al. (2022) and was originally taken from Nadelhoffer et al. (2014). All items use a seven-point Likert scale from -3 (strongly disagree) to +3 (strongly agree). Examples of the dualism and determinism items, respectively, include: “Please rate how much you agree or disagree with the following statements. – The physical and the mind (and/or consciousness) are completely distinct and separate aspects of primary reality.” And “Please rate how much you agree or disagree with the following statements: Everything that has ever happened had to happen precisely as it did, given what happened before.” Full text of all items is available in Table 2. Cronbach’s alpha for all 4 items is 0.3. These were collected three times, at baseline following the informed consent, 2-4 weeks after the session, and 2-3 months after the session.

Atheist-Believer status.

This item was taken from Nayak et al. (2022) and consists of a single item. Participants were asked to respond to the following question: “How would you characterize your overall religious or spiritual belief system?”. The response options were: “‘Non-believer (e.g., atheist)’, ‘Agnostic’, and ‘Believer (e.g., in Ultimate Reality, Higher Power, and/or God, etc.)’.” Participants were required to select only one of the provided response options. This is reported both as percentage of participants endorsing each of these categories, but also numerically with ‘Non-believer’ scored as -1, ‘Agnostic’ as 0, and

'Believer' as 1. This item was collected twice: first at baseline following the informed consent, and again 2-3 months after the session.

Descriptors of the session.

Participants completed the Mystical Experience Questionnaire (MEQ) (Barrett et al., 2015) 1-3 days after their session, and answered whether the reference psychedelic experience was their first psychedelic experience, and whether they took the psychedelic in a ceremonial setting.

Analysis

Descriptive data over time points are provided with means and standard deviations. For mind perception and metaphysical beliefs, descriptive information is also presented as the percent of participants who agree or disagree with each item, with agreement categorized as any score >0 and disagreement categorized as any score <0 .

Separate linear mixed-effects models were computed for each item, including 10 items related to mind perception, 4 items related to metaphysics, and 1 item related to religious affiliation. The outcome variables were Z-scored to facilitate interpretation of the betas as standardized mean differences (SMDs). The independent variables in each regression included time, score on the MEQ, the interaction between MEQ and time, and indicators for whether the experience was the participant's first and whether it took place in a ceremonial setting. Effect sizes are presented as standardized beta coefficients (β_{std}), which can be interpreted as covariate-adjusted Cohen's ds.

Results were Bonferroni corrected for 15 tests, for an alpha level of .003333.

Means and standard deviations (SDs) for all measures across time points as well as zero-order correlations are available in the Figure S1. These items are also presented as the percent of participants agreeing (to any degree) at each time point as well (Tables S2-S4).

Results

Results varied across measures related to mind perception, metaphysical beliefs, and Atheist-Believer status. A total of 657 unique participants were included across all three measures (Atheist-Believer status $N = 657$; metaphysical beliefs $N = 623$; and mind perception $N = 255$). The sample was mostly male (57-60%), white (86-88%), residing in the United States (72-86%), with relatively high rates of a current mood disorder (26-31%). A minority of participants endorsed the reported experience as their first psychedelic experience (13-14%). The changes in measure responses reported below were statistically significant at $p < 0.00333$ unless otherwise stated.

Mind perception.

In terms of mind perception, we observed moderate increases in the attribution of consciousness to a range of entities from baseline to the 2-4 week and 2-3 month

follow-up timepoints (Figure 1A; Table 1). Some targets were already rated quite high at baseline and were subject to probable ceiling effects, including self (the person taking the survey) and other human beings. These items did not show statistically significant changes at either follow-up time point likely due to ceiling effects.

The following targets showed significant increases of small effect size (β_{std} ranging from .15 to .28) at both follow-up time points: non-human primates, quadrupeds, insects, fungi, plants, and inanimate man-made objects. Of these, the largest increases were apparent for attribution of consciousness to insects (β_{std} [95% CI] = 0.28 [0.18, 0.39] at 2-4 weeks, and 0.35 [0.24, 0.45] at 2-3 months). In general, these items did not show substantial change from the first (2-4 weeks) to the final (2-3 months) follow-up timepoints but tended to increase (a maximum increase of $\beta_{std} = 0.08$ in the case of attribution of consciousness to fungi).

A few items, including mind perception of inanimate natural targets (e.g., a rock), inanimate manmade (e.g., a robot), and the universe as a whole showed small, statistically significant effects at one time point but not the other (see Table 1).

Metaphysical beliefs.

In terms of metaphysical beliefs, we observed little to no changes (Figure 1B; Table 2). There were no significant differences across timepoints in metaphysical beliefs regarding materialism, dualism, or idealism (with β_{std} ranging from -0.06 to 0.03) at both the 2-4 week and the 2-3 month follow-up timepoints. However, we observed a small statistically significant increase at the 2-3 month post session time point, but not the 2-4 week time point, in determinism (β_{std} [95% CI] = 0.12 [0.06, 0.19]).

Atheist-Believer status.

Atheist-Believer status showed no change (Figure 2; Table 3). At baseline, 24% of respondents identified as atheist, compared to 25% at 2-3 month follow-up. Similarly, 46% identified as a ‘Believer’ at baseline, compared to 47% at 2-3 month follow-up. Restricting this to the 172 respondents who had never taken a psychedelic before, there is also no change. At baseline 26% of psychedelic-naïve respondents identified as atheist, compared to 28% at 2-3 month follow-up; 33% of psychedelic-naïve respondents identified as a ‘Believer’ at baseline, compared to 34% at 2-3 month follow-up.

While previous research has shown decreases in the category of ‘non-believer (e.g., atheist)’ after psychedelic experiences (e.g., Nayak et al., 2022), here we observed a nominal (non-significant) increase. Overall, we observed no changes in religious affiliation categories from pre- to post-psychedelic experience.

Figure 1. Changes in attribution of consciousness to various entities (mind perception), metaphysical beliefs, and Atheist-Believer status. (A) Statistically significant increases in attribution of consciousness (i.e., mind perception) were observed at both follow-up timepoints for non-human primates, quadrupeds, insects, fungi, and plants. **(B)** Metaphysical beliefs remained mostly unchanged though determinism was statistically significantly increased at the 2-3 month follow-up timepoint. **(C)** There was no change in Atheist-Believer status.

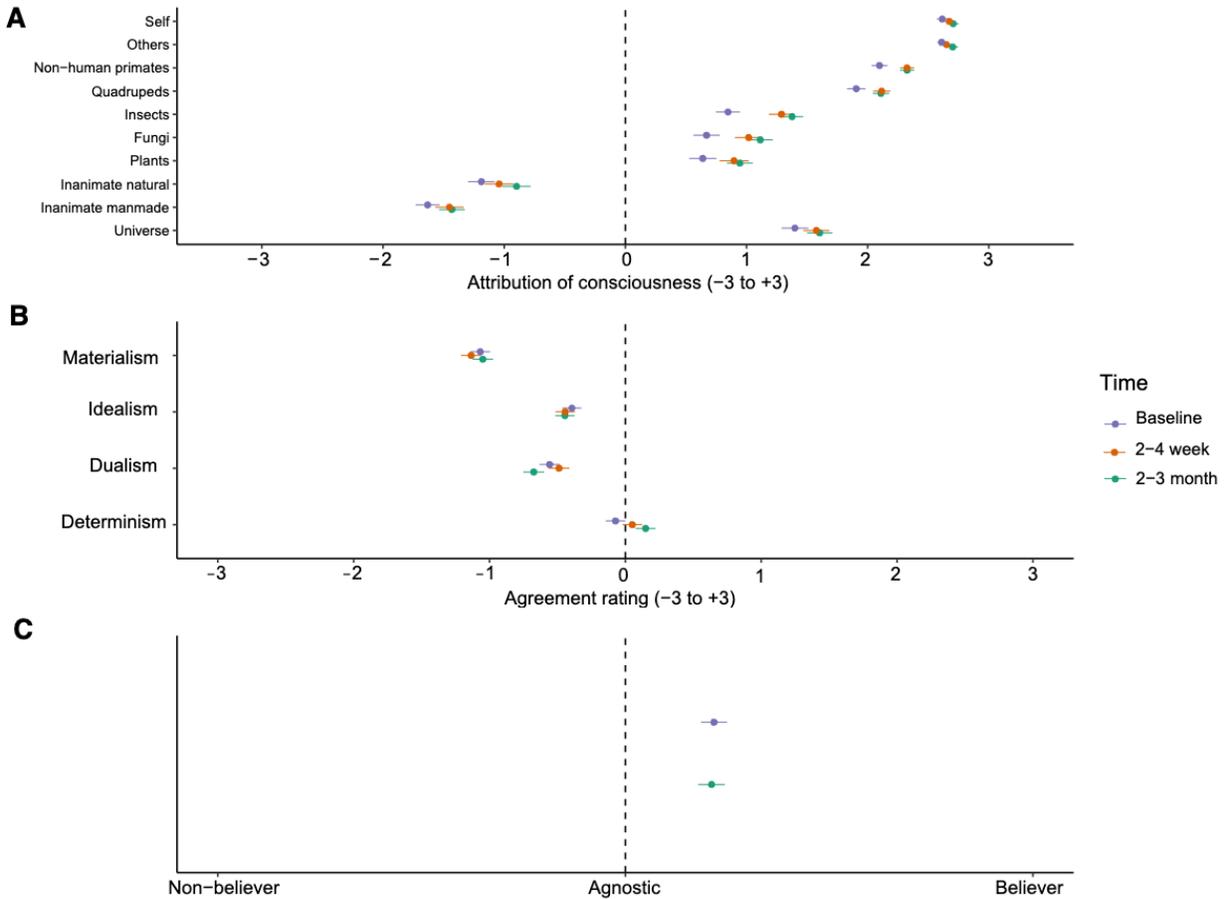
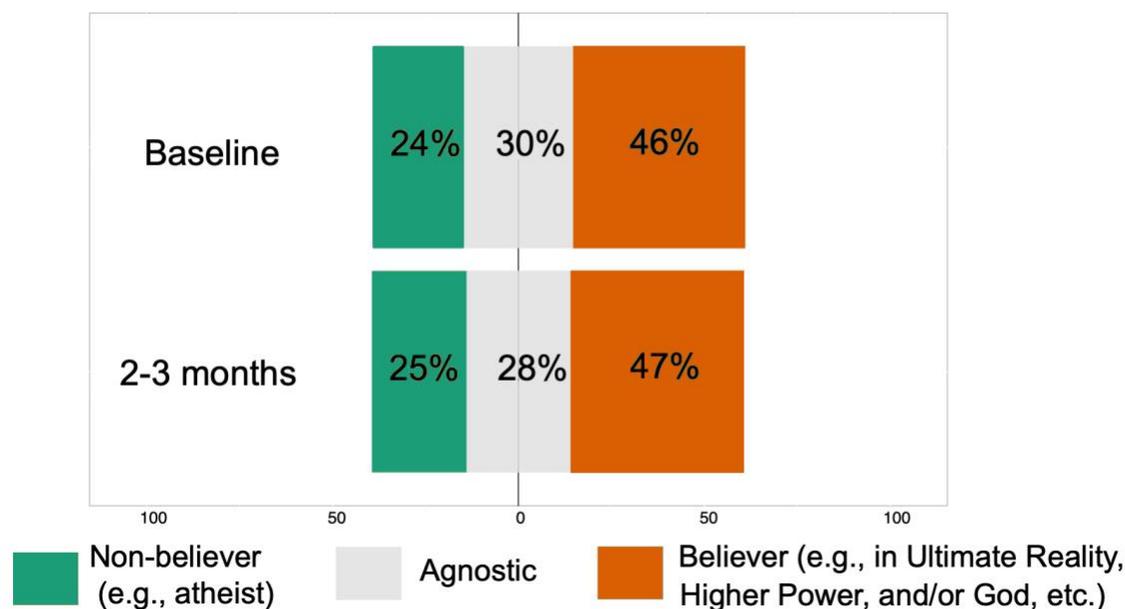


Figure 2. Percentage of respondents identifying as ‘Non-believer (e.g., atheist)’, Agnostic, and ‘Believer (e.g., in Ultimate Reality, Higher Power, and/pr God, etc.)’ at baseline and 2-3 month follow-up. Only negligible changes were observed in Atheist-Believer status.



Descriptors of the session.

Mean (SD) MEQ scores were 0.5 (0.3) among respondents for all three sets of questions, and 13-14% of participants reported on their first lifetime psychedelic session, and 2-4% used it in a ceremonial setting (Table S1).

The effect of MEQ scores over time was not significant for any of the 15 measures, indicating higher MEQ was not related to greater degree of belief change. There was similarly no effect of taking a psychedelic in a ceremonial setting on belief changes. The effect of taking a psychedelic for the first time was only significant for the item “The universe is conscious,” with medium effect size β_{std} [95% CI] = 0.68 [0.36, 1.01] ($p < .0033$).

Discussion

Our findings showed different patterns across the measures of 1) mind perception, 2) metaphysical beliefs, and 3) Atheist-Believer status. We discuss each of these in turn.

First, replicating effects from Nayak and Griffiths (2022) and Nayak et al. (2022) we found that mind perception was increased over a range of entities. For example,

compared to pre-drug baseline, participants indicated more perception of mind at both post-drug follow-up time points to non-human primates, quadrupeds, fungi, and plants.

These targets of consciousness attribution are most relevant to mind perception research conducted by Gray et al. (2007; 2011; Waytz; 2010). Mind perception decomposes into the capacity for experience (feel pleasure and pain) and agency (make decisions and act) across a range of entities (rocks, plants, animals, humans, robots, god, etc.). Research using this measure has found systematic changes in mind perception related to certain mental disorders (Gray et al., 2011). For example, people with autism show decreased perception of the capacity for agency in other people (but not experience). People with psychopathy show decreased perception of the capacity for experience in other people (but not agency). People with schizotypy show increased attribution of agency and experience across nearly all targets. The present study did not differentiate between agency and experience, but rather asked participants to rate the capacity “of having conscious experience” to a range of entities, we found across the board increases in consciousness attribution (i.e., mind perception).

Some mind perception research has focused on issues related to mental illness (Gray et al., 2011), and there are reasons to examine a link to delusions in the context of increased attribution of agency. For example, conspiratorial thinking often rests on an attribution of (malevolent) agency to current events (Wegner & Gray, 2017). Others have proposed that the perception of mind may result in enhanced feelings of social-like connection which could enhance well-being (e.g., “a social-spatial conflation”, Yaden, Haidt, Hood, Vago, & Newberg, 2017). It is likely that the increased mind perception from psychedelic increases can have positive, pathological, or mixed consequences. This is an important area for future study.

Second, contrary to recent psychedelic research findings showing shifts in metaphysical beliefs (Nayak et al., 2022; Timmermann et al., 2021), we found little to no evidence of such shifts in this large prospective study. For example, we found no significant change in endorsement of items relating to dualism, materialism, or idealism while all three of these were found to increase significantly after a psychedelic experience in either or both previously referenced papers (Nayak et al., 2022; Timmermann et al., 2021). We did find a small difference in determinism endorsement in this study at 2-3 month post session, which supports a previously reported finding in Nayak et al. (2022). Psychedelics may very well cause such belief changes, but the present the data suggest they do not occur on average in naturalistic use. To the extent that such belief changes do occur, they may 1) be more likely in a particular subset of individuals, 2) rely on particular contextual factors, and/or 3) require multiple psychedelic experiences over time.

The measurement of these non-naturalistic beliefs is difficult and the relationship between the items administered to the normal population in this study and the technical philosophical views they represent remains in question. Substantial additional validation is required for these measures (see Letheby & Mattu, 2022; Yaden & Anderson, 2021). However, given the concerns raised about changes in these kinds of beliefs from

psychedelic experiences (e.g., Jacobs, 2020; Smith & Sisti, 2021), our findings provide evidence that concerns around changes to such beliefs may have been inflated given the magnitude of such changes observed in the present study.

Third, contrary to recent psychedelic research finding increases in endorsements of Atheist-Believer status in retrospective self-report surveys (Davis et al., 2020; Griffiths et al., 2019; Nayak et al., 2022), this prospective longitudinal self-report survey did not observe such changes. As with the lack of change in non-naturalistic beliefs, the lack of change to Atheist-Believer status should reduce the urgency of bioethical discourses regarding the potential of non-therapeutic belief changes in general.

The present study provides stronger evidence than the Timmermann et al. (2021) prospective component, which found increased non-naturalistic beliefs in a population using psychedelics in a ceremonial setting. The present study, by prospectively recruiting a population that planned to use psilocybin mushrooms in a variety of settings (mostly not in ceremonial ones), provides a more fine-grained sense of the kinds of belief changes that occur with naturalistic psilocybin use across a range of settings.

The present study represents a substantial increase in methodological rigor over Nayak et al. (2022). In particular, the Nayak et al. (2022) survey study format asked participants to indicate their beliefs *before* and *after* a psychedelic experience as well as their beliefs *now*. The *before* findings from Nayak et al. (2022) were substantially lower than baseline in the present study. Meanwhile, findings across baseline and follow-up timepoints in the present study are relatively close to the *after* and *now* results from the Nayak et al. (2022) study. It is possible that the before/after/now self-report format may artificially suppress endorsements in the before category. Alternatively, respondents with lower baseline belief may have greater capacity for belief change and be more likely to respond to a survey about a belief-changing psychedelic experience. In any case, we believe that caution should be taken when engaging in such an approach in retrospective self-report research going forward.

Limitations

The study was limited in a number of ways. First, the measures have not been validated. Each of these measures should be examined for their psychometric properties, their convergent/divergent validity, and overall reliability. The measures should also be applied in a better representative sample. For example, this study population was predominantly white so data from each measure may not generalize to the wider population including underrepresented non-white ethnic and minority groups.

A non-psychedelic control group was also absent in this study. This control data would have served as a valuable comparator for the measures. In the current study, we observed minimal belief changes yet a control group would provide additional information and would be valuable in future research.

The actual use of psilocybin was not confirmed in this study. Future studies could consider ways in which ingestion may be confirmed.

Incorporating belief change measures into the growing body of randomized controlled trial research with psychedelics would allow the question these measures ask to become the focal point of discussion rather than the limitations which carry substantial weight at this point.

Conclusion

In this prospective, longitudinal survey of psychedelic experiences, we found that mind perception was increased but that metaphysical beliefs and Atheist-Believer status were almost or entirely unchanged. These results provide more evidence that constructs such as mind perception and mentalization are related to psychedelic experiences. However, these findings suggest that concerns that psychedelics change metaphysical beliefs or result in 'conversions' across religious affiliations have been overestimated. Further research is required across each of these topics, and concerns related to providing adequate informed consent remain well-founded, but concerns related to changes in non-naturalistic beliefs or religious affiliation may be exaggerated.

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Table 1. Change in mind perception of various living and non-living entities from baseline, expressed as effect sizes ($n = 255$)

	Time point	
	β_{std} [95% CI]	
	2-4 week	2-3 month
<p>Self</p> <p>I (the person taking the survey right now) am capable of having conscious experience.</p>	0.09 [-0.08, 0.26]	0.12 [-0.05, 0.29]
<p>Others</p> <p>Other human beings are capable of having conscious experience.</p>	0.07 [-0.09, 0.24]	0.14 [-0.02, 0.3]
<p>Non-human primates</p> <p>Some (if not all) non-human primates (e.g. chimpanzees) are capable of having conscious experience.</p>	0.28 [0.15, 0.41]*	0.3 [0.17, 0.43]*
<p>Quadrupeds</p> <p>Some (if not all) four-legged animals (e.g., cats, dogs) are capable of having conscious experience.</p>	0.21 [0.09, 0.33]*	0.24 [0.12, 0.36]*
<p>Insects</p>	0.28 [0.18, 0.39]*	0.35 [0.24, 0.45]*

Some insects (e.g. ants, flies) are capable of having conscious experience.		
Fungi Some fungi (e.g. mushrooms) are capable of having conscious experience.	0.19 [0.1, 0.28]*	0.27 [0.18, 0.35]*
Plants Plants (e.g., trees, flowers) are capable of having conscious experience.	0.15 [0.07, 0.24]*	0.19 [0.11, 0.27]*
Inanimate natural Inanimate natural objects (e.g., rocks) are capable of having conscious experience.	0.09 [0, 0.18]	0.16 [0.07, 0.25]*
Inanimate man-made Inanimate man-made objects (e.g. chairs, buildings) are capable of having conscious experience.	0.12 [0.03, 0.21]*	0.13 [0.04, 0.21]
Universe The universe is conscious.	0.12 [0.04, 0.2]	0.13 [0.05, 0.21]*

*p < .00333

Changes in Mind Perception items from baseline across both follow-up timepoints are shown. Standardized β 's can be considered covariate-adjusted Cohen's ds and 95% confidence intervals are provided.

Table 2. Change in metaphysical beliefs, expressed as effect sizes ($n = 623$)

Metaphysical belief	Time point	
	β_{std} [95% CI]	
	2-4 week	2-3 month
Materialism There is just one primary reality: the physical. The mind (and/or consciousness) is just physical/functional properties of the brain which have an entirely material explanation.	-0.04 [-0.1, 0.03]	0.01 [-.06, 0.07]
Idealism There is just one primary reality: the mind (and/or consciousness). All material things derive from the mind (and/or consciousness).	-0.04 [-0.12, 0.04]	-0.03 [-0.11, 0.06]
Dualism The physical and the mind (and/or consciousness) are completely distinct and separate aspects of primary reality	0.03 [-0.04, 0.11]	-0.06 [-0.14, 0.01]
Determinism Everything that has ever happened had to happen precisely as it did, given what happened before	0.08 [0.01, 0.14]	0.12 [0.06, 0.19]*

* $p < .00333$

Changes in Metaphysical Beliefs items from baseline across both follow-up timepoints are shown. Standardized β 's can be considered covariate-adjusted Cohen's ds and 95% confidence intervals are provided.

Table 3. Change Atheist-Believer status, expressed as effect size (n = 657)

	2-3 month β_{std} [95% CI]
Religious affiliation	-0.09 [-0.19, 0.02]

Change in Atheist-Believer status from baseline to 2-3 month follow-up is shown. Standardized β 's can be considered covariate-adjusted Cohen's ds and 95% confidence interval are provided.