6 things we learned from the world’s first study examining LSD’s effect on the human brain

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The first study using LSD in over 50 years sought to answer three questions: How does LSD so profoundly change consciousness? What changes underlie these effects? And how could psychedelics be therapeutically beneficial?

To find the answers, the Beckley/Imperial Research Programme realised they needed to see the physical effects LSD has on the brain when taken – something never before attempted or accomplished.

After giving 20 people either LSD or a placebo and requiring them to complete brain imaging and self-report questionnaires, here’s what was discovered.

1. All participants reported profound changes in consciousness.
This is probably to be expected – when under the influence of LSD you’d expect to experience visual hallucinations and an altered state of consciousness. You’d likely be disappointed if you didn’t.

2. Brain regions involved in vision were active even with the eyes shut.

A number of properties usually associated with visual stimulation were discovered from the brain imaging. The visual cortex was found to communicate significantly more with the rest of the brain on LSD than on the placebo, and the increase in activity correlated with self-reported hallucinations.

Brain waves were also measured and changes to the waves in visual regions also correlated with hallucinations, while blood flow to visual regions was something else that increased.

“We saw that many more areas of the brain than normal were contributing to visual processing under LSD – even though the volunteers’ eyes were closed,” said Dr Robin Carhart-Harris, from Imperial College London.
3. There was a loss of “integrity” within brain networks.

Brain regions that when combined create networks lost connectivity with one another, causing a decrease in “integrity” (read unity, wholeness, cohesion). For example, the Default Mode Network (DMN) – known to be involved in many different brain functions including information about self, thinking about others, remembering the past and imagining the future – showed a reduction in integrity that correlated with self-reported “ego-dissolution” and “altered meaning”.

The researchers suggest this could mean the “DMN underlies a stable sense of self and other aspects of normal consciousness”.

Hyperactivity of the DMN has been previously linked to depression.

4. Communication between brain networks increased.

While communication and activity within specific brain networks decreased, communication between different networks which may not normally be in contact increased.

Previous work by the same researchers showed similar effects from psilocybin, the key compound in magic mushrooms, and they argue that the decrease in DMN activity coupled with increased communication between distinct networks creates “a more fluid and disorganised state of consciousness” where “new associations are made, and rigid patterns of behaviour may be broken down”.

“Normally our brain consists of independent networks that perform separate specialised functions, such as vision, movement and hearing – as well as more complex things like attention. However, under LSD the separateness of these networks breaks down and instead you see a more integrated or unified brain,” said Dr Carhart-Harris.

He added: “Our brains become more constrained and compartmentalised as we develop from infancy into adulthood, and we may become more focused and rigid in our thinking as we mature. In many ways, the brain in the LSD state resembles the state our brains were in when we were infants: free and unconstrained. This also makes sense when we consider the hyper-emotional and imaginative nature of an infant’s mind.”

5. Music and LSD work strangely together.
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A sheet of LSD tabs (Paul Faith/PA)

Other research from the same study showed that music can have a strange effect on the brain’s visual system under the influence of LSD. It caused the visual cortex to receive information from a brain region called the parahippocampus which is associated with mental images and personal memory. The more the parahippocampus communicated with the visual cortex, the more people reported experiencing complex visions, such as scenes from their lives.

6. More research on LSD should be granted.

Dr Carhart-Harris, Professor Nutt and Beckley Foundation director Amanda Feilding (Beckley Foundation)

Professor David Nutt was a lead researcher in this study, as well as a similar one using psilocybin, where he concluded that the drug could be effective in treating depression and addiction. However, psychedelic drugs are classified as schedule one, making it nigh-on impossible to conduct research using them as they’re deemed to have no medicinal value.

Former Government drugs adviser Professor Nutt said: “Scientists have waited 50 years for this moment – the revealing of how LSD alters our brain biology.

“For the first time we can really see what’s happening in the brain during the psychedelic state, and can better understand why LSD had such a profound impact on self-awareness in users and on music and art. This could have great implications for psychiatry, and helping patients overcome conditions such as depression.”

Other questions the Beckley Foundation and Imperial College hope to answer in the future include broader questions about the ego.