Take a trip into the mind of people on LSD: Scans reveal how the drug 'opens' up the brain to mimic how a baby sees the world

- Experts found people experiencing drug-induced hallucinations 'see' with many parts of the brain - not just the visual cortex as usual
- They found LSD breaks down the barriers separating brain networks
- May explain the feeling of 'connectedness' often reported by LSD users
- This level of openness is also similar to how a baby's brain reacts

By Sarah Griffiths and Victoria Woollaston for MailOnline
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Users of LSD may see psychedelic rainbow visions, but researchers have taken an equally extraordinary trip into the mind of volunteers high on the drug.

Their controversial study found people experiencing drug-induced hallucinations 'see' with many parts of the brain, not just the visual cortex that normally processes information from our eyes.

LSD also had the effect of breaking down the barriers separating brain networks that perform functions such as vision, movement and hearing so that they form a more holistic state.

This may underlie religious or spiritual feelings of 'connectedness' often reported by users of the drug, the scientists believe.

This level of openness is also similar to how a baby's brain reacts to certain stimuli.

A total of 20 participants received either an injection of LSD or a 'dummy' placebo drug before having their brains scanned.

The researchers used various techniques including function magnetic resonance imaging (fMRI) and magnetoencephalography (MEG) that measure blood flow and electrical activity.

All volunteers judged by experts to be psychologically and physically healthy and all had previously taken some kind of psychedelic drug.

Dr Robin Carhart-Harris, from Imperial College London, who led the research, said: 'We observed brain changes under LSD that suggested our volunteers were "seeing with their eyes shut" - albeit they were seeing things from their imagination rather than from the outside world.

'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.'

A total of 20 participants received either an injection of LSD or a 'dummy' placebo drug before having their brains scanned. These scans show the brain activity of volunteers on the placebo drug.

Furthermore, the size of this effect correlated with volunteers’ ratings of complex, dreamlike visions.

Describing the 'altered consciousness' effects of LSD, Dr Carhart-Harris added: '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.

HOW LSD AFFECTS THE BRAIN

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Other results 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.

'However, under LSD the separateness of these networks breaks down and instead you see a more integrated or unified brain.'

The results suggest this effect is also related to what people sometimes call 'ego-dissolution'.

This relates to when the normal sense of self is broken down and replaced by a sense of reconnection with themselves, others and the natural world.

'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,' continued Dr Carhart-Harris.

'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.'

The scientists, whose findings are reported in the journal Proceedings of the National Academy of Sciences, were working in collaboration with the Beckley Foundation, a charity which promotes evidence-based drugs policy.

PhD student Mendel Kaelen, from Imperial College, who led the music research, said: 'This is the first time we have witnessed the interaction of a psychedelic compound and music with the brain's biology.'

The investigation could pave the way for compounds such as LSD one day being used to treat psychiatric disorders, said the scientists.

They could be especially useful in conditions that lead to entrenched thought patterns, such as depression and addiction, it is claimed.

Under the influence of LSD, the separateness of vision, movement and hearing networks breaks down and instead people see a more integrated or unified brain. This leads to hallucinations (activity pictured left) and what people sometimes call 'ego-dissolution' (right), which means the normal sense of self is broken down.
Dr Carhart-Harris said: 'We observed brain changes under LSD that suggested our volunteers were "seeing with their eyes shut" - albeit they were seeing things from their imagination rather than from the outside world. The image on the left shows brain activity under a placebo drug, and brain activity under LSD (right).

Former Government drugs adviser Professor David Nutt, director of neuropsychopharmacology at Imperial College, one of the project's senior researchers, told Press Association: '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,' he said.

In 2009 Professor Nutt was sacked from his job chairing the Government's Advisory Council on the Misuse of Drugs after claiming that drugs such as ecstasy and LSD were less harmful than alcohol or tobacco.

Amanda Fielding, director of the Beckley Foundation, said: 'We are finally unveiling the brain mechanisms underlying the potential of LSD, not only to heal, but also to deepen our understanding of consciousness itself.'