Cannabinoids Disrupt Memory Encoding by Functionally Isolating Hippocampal CA1 from CA3

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Research into cannabinoids (CBs) over the last several decades has found that they induce a large variety of oftentimes opposing effects on various neuronal receptors and processes. Due to this plethora of effects, disentangling how CBs influence neuronal circuits has proven challenging. This paper contributes to this by using data driven modeling to examine how THC affects the input-output relationship in the Schaffer collateral synapse in the hippocampus. It was found that THC functionally isolated CA1 from CA3 by reducing feedforward excitation and theta information flow while simultaneously increasing feedback excitation within CA1. By elucidating the circuit mechanisms of CBs, these results help close the gap in knowledge between the cellular and behavioral effects of CBs.

The use of sophisticated computational and system identification techniques to interpret complex biological datasets makes this paper ideally suited for PLOS Computational Biology. Furthermore, a central theme in the paper is that such techniques can offer neuroscientists greater insight than more conventional techniques. We make an effort to directly compare these techniques in the paper.