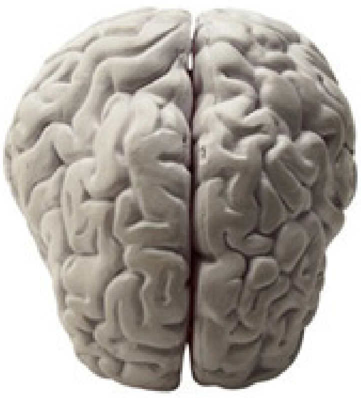
New brain research refutes results of earlier studies that cast doubts on free will

7 August 2012, by Bob Yirka



(Medical Xpress) -- When people find themselves having to make a decision, the assumption is that the thoughts, or voice that is the conscious mind at work, deliberate, come to a decision, and then act. This is because for most people, that's how the whole process feels. But back in the early 1980's, an experiment conducted by Benjamin Libet, a neuroscientist with the University of California, cast doubt on this idea.

He and his colleagues found in watching EEG readings of volunteers who had been asked to make a spontaneous movement (it didn't matter what kind) that brain activity prior to the movement indicated that the subconscious mind came to a decision about what movement to make before the person experienced the feeling of making the decision themselves. This, Libet argued, showed that people don't have nearly the degree of free will regarding decision making, as has been thought. Since then, no one has really refuted the theory.

Now new research by a European team has found evidence that the brain activity recorded by Libet and other's is due to something else, and thus, as they write in their paper published in the *Proceedings of the National Academy of Sciences*, that people really do make decisions in their conscious mind.

To come to this conclusion, the team looked at how the brain responds to other decision forcing stimuli, such as what to make of visual input. In such instances, earlier research has shown that the brain amasses neural activity in preparation for a response, giving us something to choose from. Thus the response unfolds as the data is turned into imagery our brains can understand and we then interpret what we see based on what we've learned in the past. The researchers suggest that choosing to move an arm or leg or finger, works the same way. Our brain gets a hint that we are contemplating making a movement, so it gets ready. And it's only when a critical mass occurs that decision making actually takes place.

To test this theory, the team built a computer model of what they called a neural accumulator, then watched as it behaved in a way that looked like it was building up to a potential action. Next, they repeated the original experiment conducted by Libet et al but added another element, a click noise. Each volunteer was asked to make a decision right away if they heard the click while they were mulling over their choices. The thinking was that for those who had built up a neural response already and were near the threshold, a faster response should come about, and in looking at the EEG data and comparing them to clicks, that's exactly what they found. This, the team says, proves that it was still the conscious mind making the decision; the subconscious was just doing background work to get ready.

More information: An accumulator model for spontaneous neural activity prior to self-initiated movement, *PNAS*, Published online before print August 6, 2012, doi: 10.1073/pnas.1210467109

Abstract

A gradual buildup of neuronal activity known as the "readiness potential" reliably precedes voluntary self-initiated movements, in the average time locked to movement onset. This buildup is presumed to reflect the final stages of planning and preparation for movement. Here we present a different interpretation of the premovement buildup. We used a leaky stochastic accumulator to model the neural decision of "when" to move in a task where there is no specific temporal cue, but only a general imperative to produce a movement after an unspecified delay on the order of several seconds. According to our model, when the imperative to produce a movement is weak, the precise moment at which the decision threshold is crossed leading to movement is largely determined by spontaneous subthreshold fluctuations in neuronal activity. Time locking to movement onset ensures that these fluctuations appear in the average as a gradual exponential-looking increase in neuronal activity. Our model accounts for the behavioral and electroencephalography data recorded from human subjects performing the task and also makes a specific prediction that we confirmed in a second electroencephalography experiment: Fast responses to temporally unpredictable interruptions should be preceded by a slow negative-going voltage deflection beginning well before the interruption itself, even when the subject was not preparing to move at that particular moment.

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