The Exploration of Free Will on the Libet Experiment

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Abstract

The Libet Experiment attempted to explain the neurology of “free will” by measuring brain waves during decision-making exercises. EEGs were used to measure the brain waves of voluntary movement and the initial intention of that voluntary movement. The most important finding was the gap between the readiness potential and intention to move. This causes an unconscious intention to move before an actual movement is performed. This gap suggests a counter to the idea of free will, which originally suggested that thought influences action. However, these findings don’t completely invalidate the classical ideas of free will. But they still suggest that our consciousness doesn’t have complete control of these movement exercises.

Hypothesis/Introduction

In our understanding of psychology, neuroscience, and behavior, the Libet Experiment has profound implications. The concept of “free will” has, for most of human history, been at the peak of philosophical discussion, and the Libet Experiment attempted to dissect the concept of free will to our own brain wave patterns. Libet’s findings would eventually raise concern over the validity of free will and if we possessed it. Libet’s hypothesis was that an involuntary brain activity spike occurred immediately before we made a voluntary decision to make a decision, or more specifically, move. Libet’s subject’s brain activities were measured using EEGs to find the spike in brain activity when instructions were given to lift a finger. Measurements of the time difference between the activity linked to the unconscious decision to lift the finger (described as a readiness potential) and the brain activity linked to the actual movement. Libet hypothesized that experimentation should conclude that a neural signal known as a “readiness potential” precedes any voluntary movement which negates the classical idea of “free will”.

Materials/Methods

Materials

The goal of the Libet Experiment was to determine when neural activity spiked in the context of subjects' voluntary movements. Electroencephalographs (EEG's) were used to measure brain activity and electromyographs (EMG's) were used to record muscle movement. Another important feature of the experiment was an oscillating clock with a dot moving in a circular motion. Subjects were tasked with recording the position of the dot when they were aware of their intention to move.

- EEG's: used to measure brain activity. These gave accurate readings of the desired "readiness potential"
- EMG's: used to measure muscle movement. These gave accurate readings of when muscles moved following the intention of subjects to move
- Oscillating Clock: allowed subjects to guess the location of the dot when they intended to move.

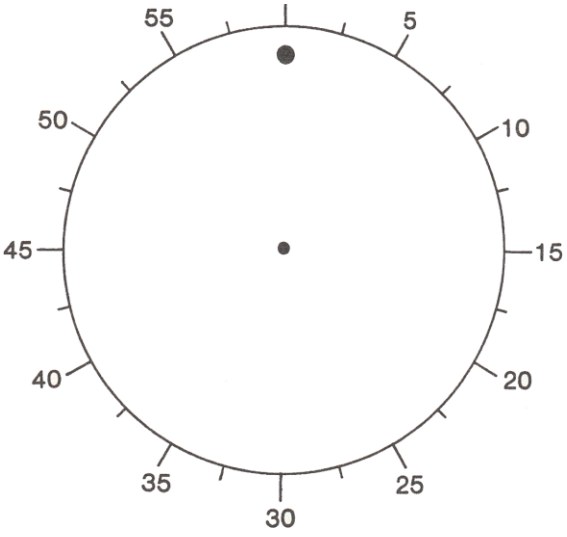


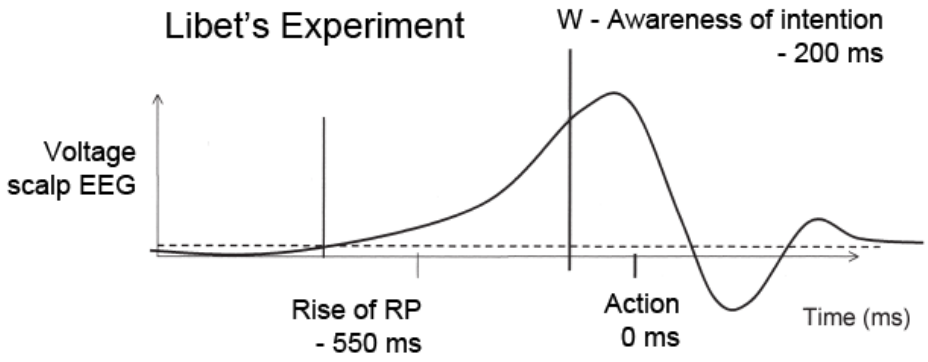
Diagram of the oscillating clock. The dot at the top rotated clockwise

Methodology

8-10 healthy adults were used as subjects for this experiment. Adults were equipped with EEGs to measure brain activity and EMGs to record muscle movement. Subjects were then tasked with making a minor movement (such as a lifting of the finger or flexing of the wrist) at their discretion while observing an oscillating clock. As soon as they made the conscious decision to move, subjects were asked to note the position of the dot on the oscillating clock. Before and during the subjects performing the movement, EEG's measured brain wave data to determine the point of the readiness potential.

Results

On average, subjects recorded their awareness of their intention to move (referred to as *W*) to be 200 milliseconds before the movement onset. The readiness potential began nearly twice as early, at roughly 550 milliseconds before the movement onset. Finally, the actual onset of movement occurred roughly 150 milliseconds after subjects were aware of their intentions.



A graph depicting the rise of neural activity before and after the onset of movement

Discussion

The primary goal that Libet hoped to reach was challenge the classical ideas of free will. He hoped to do this by concluding that the neural spike interpreted as the "readiness potential" came before the conscious intention to perform a movement, meaning the brain unconsciously prepared for movement before consciously preparing. At first glance, the results would seem to work in his favor. The readiness potential occurred much earlier than the conscious decision to move, nearly twice as early. Libet concluded that conscious will is too slow to make decisions and the "decision" to move is performed by unconscious processes in the brain. Further, he suggested that in the time interval between the conscious decision to move (*W*) and the actual onset of movement existed the possibility for the subjects to veto their movement. This *veto* is where we find the role of conscious will in the process.

Criticisms

Several critiques of the Libet Experiment have emerged since its publication, especially from supporters of the classical notion of free will. Critiques questioned the role of the oscillating clock and the possibility for human error. There is a large possibility that human error came because of the human subjects that had to record the position of the oscillating dot while performing a task. This task was, of course, very novel, but this doesn't erase the possibility of human error especially in a potentially stressful lab environment.

Conclusions

The data surrounding the readiness potential and the conscious intention to perform a movement suggests that unconscious neural processes direct our actions, rather than a conscious will. These findings greatly call into question the classical ideas of free will. Whether free will is real or just an illusion remains up for debate. However, Libet's findings contributed greatly to the discussion. It calls into question multiple scientific, biological, and philosophical concepts and how they relate to our lives.

References

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