

## RESEARCH ACTIVITY: From intention to action

How long does it take for the brain to translate our conscious intentions into actions? In this research activity, we will explore the relationship between deciding to perform a motor action (raising a finger), and actually executing the action.

### The task

For this task, you will also need an accurate stopwatch (able to measure tens of milliseconds), and a large analogue clock face with an accurate second hand.

Hold the stopwatch in one hand and watch the analogue clock face carefully. Start the stopwatch at the precise moment when the second hand of the clock crosses the “12” mark. You may need to practise this a few times to make sure that the timings on the watch and clock are synchronised. Now begin the experiment.

As before, start the stopwatch when the second hand of the clock crosses “12”. Then, at some point within the next minute, randomly make a decision to stop the stopwatch, while at the same time carefully noting what the position of the second hand of the clock was when you made the decision. This should give you two readings:

1. The position of the second hand on the analogue clock face (when you made the decision).
2. The digital reading of the stopwatch (when you actually performed the action).

Record these two values on a sheet of paper. Repeat this at least 25 times and record your readings each time.

### Dealing with the data

You should have a table with two columns, one indicating the timing of your decision, and one indicating the timing of your action, as shown below. To obtain the time taken to execute the action on each trial, subtract the timing of your decision (clock) from the timing of your action (stopwatch). Take the average of all the values in the final column. This is an approximation of the average time taken for you to translate conscious intention into motor action.

| <b>Trial no.</b> | <b>Timing of decision (clock)</b> | <b>Timing of action (stopwatch)</b> | <b>Time taken to execute action</b> |
|------------------|-----------------------------------|-------------------------------------|-------------------------------------|
| 1.               | e.g., 43.5 s                      | e.g., 43.83 s                       | e.g., 0.33 s                        |
| 2.               |                                   |                                     |                                     |
| 3.               |                                   |                                     |                                     |
| 4.               |                                   |                                     |                                     |
| 5.               |                                   |                                     |                                     |

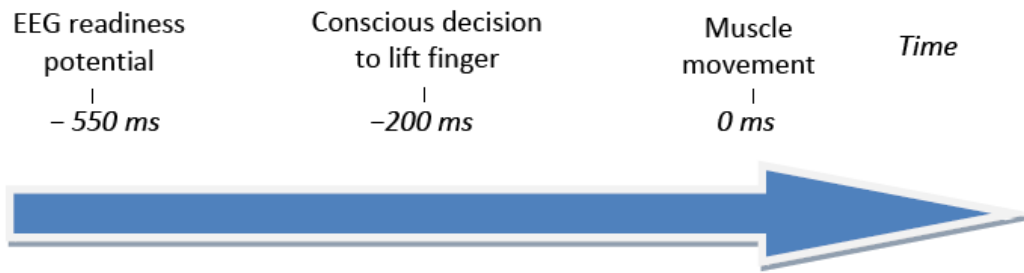
|     |  |  |         |
|-----|--|--|---------|
| 6.  |  |  |         |
| 7.  |  |  |         |
| 8.  |  |  |         |
| 9.  |  |  |         |
| 10. |  |  |         |
| 11. |  |  |         |
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| 18. |  |  |         |
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| 20. |  |  |         |
| 21. |  |  |         |
| 22. |  |  |         |
| 23. |  |  |         |
| 24. |  |  |         |
| 25. |  |  |         |
|     |  |  | Average |

**Predictions**

You should find that your conscious decision precedes the actual action of stopping the stopwatch by at least 200 ms.

One of the first experiments to address the timing of decisions directly was conducted by Benjamin Libet and his colleagues in 1983. In this experiment, subjects watched a rapidly moving clock hand and made a mental note of when they decided to lift their finger. At the same time, an electromyogram recorded their actual muscle activity, and EEG activity in the brain was also measured.

The EEG results demonstrated that the cortex became active with a “readiness potential” about 350 ms before participants reported awareness of a “wish to move”. Actual muscle activity followed some 200 ms after this.



This experiment suggested that our subjective awareness of a decision occurs measurably later than the actual events of deciding occur in the brain.

### Ask yourself

1. Does conscious awareness of a decision precede or follow from brain “preparatory” activity?
2. Is it possible to stop an action that is already being prepared by the brain?

### Reference

Libet B., Gleason, C.A., Wright, E.W. & Pearl, D.K. (1983). Time of conscious intention to act in relation to onset of cerebral activity (readiness-potential). The unconscious initiation of a freely voluntary act. *Brain*, 106: 623–42.