

A Contribution on the Question of Free Will

40 Years since the Libet Experiment – Where Do We Stand Today?

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Over 40 years ago, an experiment was conducted which would shock experts in the field all around the globe [1]. It essentially found the following: The decision to perform a certain movement, which is perceived as a conscious one, on average only takes place about half a second after a readiness potential (RP) has started to develop in the cortex. The authors concluded that before we even decide to carry out an action, it has already been initiated independently of our will. These results, published by Benjamin Libet, massively rocked the foundations of any certainty about human free will.

A closer look at the experiment revealed the following: Test subjects were instructed to “spontaneously decide to bend a finger from their right hand [...]” [2]. At the same time, they would look at an oscilloscope clock with a revolving pointer. The task was to take note of the position of the revolving pointer, particularly focusing on the time when subjects decided to carry out the movement. In all test subjects, a RP was measured by filtering out the electroencephalography recordings from the corresponding motor cortex areas, which on average began to build up about half a second before the decision itself was made. At the same time as this build-up process, the dorsal loop, a circuit between the thalamus, cortex, and basal ganglia, which is activated by the limbic system (LS), was also activated repeatedly. If it is not activated, no RP can be built up, and the finger cannot be moved. As Gerhard Roth proposes, the fact that all of our actions

are emotionally motivated has led him to conclude that consequently, the LS has both the first and final word over the rational cortex [3].

However, this statement cannot be put forward with such absoluteness. The decision to participate in the experiment is not only based on emotional aspects, and consequently the LS, but also involves rational considerations. After all, a subject can stare at the oscilloscope clock for as long as he wants, but without conscious intent, his finger will not move.

That said, how can we explain the time delay of this decision in relation to the RP? Especially since it has led to the belief that subcortical centers act as the originators of our actions, thereby denying our free will. This question can be analyzed by applying the following thought experiment: A hunter is lying in wait for his prey, his rifle at the ready. The prey then enters his field of vision from the side. To hit the animal, an RP must be built up half a second before the animal is within the hunter's line of fire. But how do the basal ganglia or the LS know that they should initiate a RP half a second before the deliberate decision to shoot is made? According to the main thesis, this knowledge and, as a result, the correct timing are rehearsed right from the early stages of human development on. In fact, in infants, the RP is believed to begin concurrently with the intention, e.g., when reaching for a toy dangling over their head. As the grasping movement arrives too late, the brain gradually learns to bring the RP build-up forward by half a second until the grasping is well-timed. The sense

of time passing for this half-second is achieved over time by anchoring it in subcortical regions of the brain, just like an experienced conductor will internalize tempos, no longer needing a metronome. With that in mind, we can return to our thought experiment. If the hunter sees the prey moving at a uniform speed, a combination of the distance traveled by the prey every half a second and the hunter's internal clock can be used to estimate the moment at which the RP must be built up, i.e., at the start of that final distance traveled by the prey, half a second before entering the hunter's line of fire. The starting point of this final distance is the all-important place and time, which the cortex, connected to our subcortical sense of passage of time, relays to the LS so that the formation of the RP can be initiated. (This all occurs with no need for our attention, in the same way as we might brake slightly when approaching a curved section of road that we frequently drive down without having made any deliberate intervention.) If the animal changes direction or speed, we are unable to hit it because the aforementioned time can only be estimated when the movement is constant.

Similarly, in the Libet experiment, our (unconscious) estimation of the half-second time period plays a crucial role in ensuring that our finger moves at the planned time.

This certainly does not reduce us to mere puppets of our LS, or basal ganglia, as without a conscious intention to move our finger at the planned time, no movement is carried out. Similarly, it needs the hunter's conscious inten-

tion to shoot the prey. The subcortical centers are not able to accomplish this on their own; rather, there is a necessity for an interplay between both cortical and subcortical centers. To give a very simplistic analogy, it is like setting an alarm clock in the evening and then for it to go off in the morning without our further intervention. To claim that the alarm clock is the sole reason for us waking up overlooks the fact that it was deliberately set by us the night before.



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Conflict of Interest Statement

The author is a lecturer of the curriculum "Psychiatrie und Psychotherapie" at SWISS TCM UNI (10 lessons).

References

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